

OPERATING AND SERVICE MANUAL

8900C PEAK POWER METER

**PRELIMINARY
MANUAL**
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PEAK POWER METER

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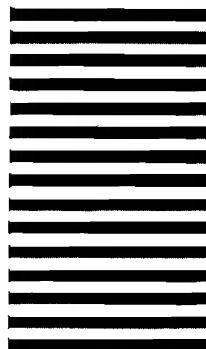
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SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 2131A.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in Section I.



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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

MANUAL PART NUMBER. 08900-90222
Microfiche Part No. 08900-90223

Printed: FEBRUARY 1982

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PEAK POWER METER

MANUAL IDENTIFICATION

Model Number: 8900C
Date Printed: February 1982
Part Number: 08900-90222

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes	Serial Prefix or Number	Make Manual Changes

► NEW ITEM

ERRATA

Page 1-2, Table 1-1:

Change the **supply** specification to the following:

Supply: 100 and 120 Vac +5, -10% 48-66 Hz and 360-440 Hz
220 and 240 Vac +5, -10% 48-66 Hz.

Page 3-5, Figure 3-4:

Under **Direct Mode (Step 6)** and **Compare Mode (Step 4)** insert the following note:

NOTE

Set the RANGE to 10 mW when measuring 10 mW or less. A significant error will occur if the power being measured is less than 10 mW and the RANGE is set to either 100 mW or 30 mW.

Page 5-3, Gain and Offset Adjustments:

In the first sentence change **.5562** to **-.5562**.

Page 8-13, Figure 8-3:

Under **INITIAL CONDITIONS** delete **Reading offset**. (Two places.)

Service Sheet 1 (schematic):

Change the **Line Voltage** (left side of service sheet) to the following:

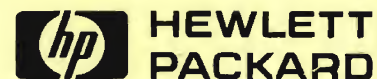
Line Voltage: 100 and 120 Vac +5, -10% 48-66 Hz and 360-440 Hz
220 and 240 Vac +5, -10% 48-66 Hz.

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

11 June 1982

1 Page



CONTENTS

	Page		Page
Section I			
GENERAL INFORMATION			
Introduction	1-1	Operator's Maintenance	3-2
Specifications	1-1	Power Line Fuse	3-2
Instruments Covered by Manual	1-1	Lamp Replacement	3-2
Description	1-2		
Warranty	1-2	Section IV	
Test Equipment Required	1-2	PERFORMANCE TESTS	
Safety Considerations	1-2	Introduction	4-1
		Equipment Required	4-1
		Test Record	4-1
		Performance Tests	4-1
		Peak Power Sensor Performance Tests	
		(Return Loss)	4-2
		Peak Power Measurement System	
		Performance Tests	4-5
Section II			
INSTALLATION			
Introduction	2-1	Section V	
Initial Inspection	2-1	ADJUSTMENTS	
Preparation For Use	2-1	Introduction	5-1
Power Requirements	2-1	Equipment Required	5-1
Line Voltage and Fuse Selection	2-1	Peak Power Meter Adjustments	5-2
Power Cable	2-1		
Interconnections	2-2	Section VI	
Mating Connectors	2-2	REPLACEABLE PARTS	
Operating Environment	2-2	Introduction	6-1
Bench Operation	2-2	Abbreviations	6-1
Storage and Shipment	2-3	Replaceable Parts List	6-1
Storage Environment	2-3	Ordering Instruction	6-1
Packaging	2-3	Parts Provisioning	6-1
Section III			
OPERATION		Section VII	
Introduction	3-1	MANUAL CHANGES	
Panel Features	3-1	Introduction	7-1
Operator's Checks	3-1		
Operating Instructions	3-1	Section VIII	
Power Measurement Accuracy	3-1	SERVICE	
Sources of Error and Measurement		Introduction	8-1
Uncertainty	3-1	Principles of Operation	8-1
RF Losses	3-1	Troubleshooting	8-1
Mismatch	3-1	Overall Troubleshooting	8-1
Instrumentation Uncertainty	3-1	Circuit-Level Troubleshooting	8-1
Specified Uncertainties	3-1	Recommended Test Equipment	8-1
Calculating Mismatch Uncertainty	3-1	Service Aids	8-2
Corrections for Error	3-2	Posidriv Screwdrivers	8-2
Correction Factor	3-2	Servicing Aids on Printed Circuit Boards	8-2
Transfer Function of the Diode Current			
Versus Input Voltage	3-2		

ILLUSTRATIONS

Figure	Page	Figure	Page
1-1. 8900C Peak Power Meter	1-0	4-1. Peak Power Sensor Performance Test (Return Loss)	4-2
2-1. Line Voltage Selection	2-2	4-2. CW Power Measurement Accuracy	4-5
2-2. Power Cables Available	2-2	4-3. Peak Power Measurement Accuracy	4-8
3-1. Front Panel Controls, Indicators and Connectors	3-3	8-1. Schematic Diagram Notes	8-3
3-2. Rear Panel Features	3-4	8-2. P/O Shaper Amplifier	8-12
3-4. Operating Instructions	3-5	8-3. Troubleshooting Block Diagram	8-13

TABLES

Table	Page	Table	Page
1-1. Specifications	1-1	6-2. Replaceable Parts	6-4
1-2. Supplemental Characteristics	1-2	6-3. Code List of Manufacturers	6-11
1-3. Recommended Test Equipment	1-3		
3-1. Power Line Fuse Information	3-2	8-1. Meter Reading and Input Voltage	8-11
4-1. Performance Test Record	4-10	8-2. Meter Reading and Input Voltage	8-11
6-1. Reference Designations and Abbreviations	6-2	8-3. Shaper Amplifier Output Voltages	8-12
		8-4. Shaper Amplifier Output Voltages	8-12
		8-5. Troubleshooting Voltages	8-13

SAFETY CONSIDERATIONS

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage and the correct fuse is installed.

SAFETY EARTH GROUND

An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set.

WARNINGS

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection). In addition, verify that a common ground exists between the unit under test and this instrument prior to energizing either unit.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to neutral (that is, the grounded side of the mains supply).

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Adjustments described in the manual are performed with power supplied to the instrument

while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.). Do not use repaired fuses or short circuited fuseholders.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (see Table of Contents for page references).



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.



MODEL 8900C



POWER CORD

Figure 1-1. 8900C Peak Power Meter

SECTION I GENERAL INFORMATION

1-1. INTRODUCTION

This manual contains operating and service information for the Hewlett-Packard Model 8900C Peak Power Meter. The Peak Power Meter is shown in Figure 1-1 with all of its externally supplied accessories.

This section of the manual describes the instruments documented by this manual and covers instrument description, specifications and other basic information. The other sections provide the following:

- Section II — Installation
- Section III — Operation
- Section IV — Performance Tests
- Section V — Adjustments
- Section VI — Replaceable Parts
- Section VII — Manual Changes
- Section VIII — Service

Listed on the title page of this manual is a "Microfiche" part number. This number can be used to order 4 x 6 inch microfiche transparencies of the manual. Each microfiche contains up to 96 photo duplicates of the manual's pages. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1-2. SPECIFICATIONS

Instrument specifications are listed in Table 1-1. These specifications are the performance standards or limits against which the instrument can be tested.

1-3. INSTRUMENTS COVERED BY MANUAL

This instrument has a two-part serial number. The first four digits and the letter are the serial number prefix which identifies the instrument configuration. The last five digits form the suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial number prefix(es) as listed under SERIAL NUMBERS on the title page.

An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted prefix indicates that the instrument is different from

those documented in this manual. The manual for this instrument is supplied with a Manual Changes supplement that contains change information that documents the differences.

In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to this manual's print date and part number, both of which appear on the title page. Complimentary copies of the supplement are available from Hewlett-Packard.

For information concerning a serial number prefix not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

Table 1-1. Specifications (1 of 2)

Frequency range: 100 MHz to 18 GHz.
 Dynamic range: 20 dB (0 to +20 dBm).
 Range: 4 ranges of 3, 10, 30 and 100 mW full scale.
 Operating Temperature: 0 to 55°C.
 Pulse Response
 Direct Mode
 Pulse width: 1 μ s to CW.
 Repetition rate: 100 Hz to 100 kHz.
 Compare mode
 Pulse width: minimum width limited by rise time.
 Repetition rate: 0 to 100 kHz.
 Rise time: 75 ns.
 Fall time: 125 ns (as measured on video output).

Meter Accuracy ¹	CW	Pulse	Transfer Accuracy CW to Pulse ³
Direct ²	± 0.2 dB	± 0.35 dB	± 0.2 dB
Compare	± 0.2 dB	± 0.25 dB	± 0.1 dB

¹ Specifications only apply in combination with specifications of 84811A sensor.

² Does not include errors due to source harmonics.

³ Error in reading pulsed power when meter is first calibrated with a known CW level. Eliminates sensor calibration error. (Mismatch errors and oscilloscope errors are not included.)

Table 1-1. Specifications (2 of 2)

General	
Supply:	100, 120, 220 or 240 Vac +5, -10%, 48 to 66 Hz.
Power:	10W, 10 V·A maximum. (3W typical).
Weight:	net, 2.7 kg (6 lb).
Dimensions:	165H x 130W x 292 mmD (6.5 x 5.1 x 11.5 in.).

Table 1-2. Supplemental Characteristics

Recorder output:	0—1 Vdc linearly proportional to the indicated power on each range. Output impedance 1 k Ω , BNC connector.
Video output:	provides detected input signal and reference line used in compare mode. Not linear with power. Nominal impedance 50 Ω , BNC connector. Typical output voltage for 1 mW input 30 mV, dc coupled.
Scope trigger output:	provides trigger signal for test oscilloscope. Typical output voltage >0.1V. Nominal impedance 50 Ω , BNC connector.

1-4. DESCRIPTION

The Hewlett-Packard Model 8900C Peak Power Meter directly displays the peak power of RF pulses over a 100 MHz to 18 GHz frequency range. Measurements can be made on pulses with widths from 1 μ s (100 ns in COMPARE mode) to CW, and repetition rates from 100 Hz (0 Hz in COMPARE mode) to 100 kHz. The dynamic range of the 8900C is 20 dB (0 to +20 dBm).

H.R.
The 8900C has two modes of operation, DIRECT and COMPARE. In the DIRECT mode the Power Meter automatically captures and displays the peak power of the pulse. In the COMPARE mode an oscilloscope is used with the 8900C to measure power at any desired point on the pulse waveform.

1-5. WARRANTY

The Peak Power Meter is warranted and certified as indicated on the inner front cover of this manual. For further information contact the nearest Hewlett-Packard Sales and Service office; addresses are provided at the back of this manual.

1-6. TEST EQUIPMENT REQUIRED

Table 1-3 lists the test equipment and accessories required to check, adjust and repair the Peak Power Meter. If substitute equipment is used it must meet the listed critical specifications.

1-7. SAFETY CONSIDERATIONS

This product is a Safety Class I instrument (provided with a protective earth terminal). The Peak Power Meter and all related documentation must be reviewed for familiarization with safety markings and instructions before operation. Refer to the Safety Considerations page found at the beginning of this manual for a summary of general safety information.

Safety information for installation, operation, and servicing is found in appropriate places throughout this manual.

Table 1-3. Recommended Test Equipment (1 of 2)

Instrument Type	Critical Specifications	Suggested Model	Use*
Digital Voltmeter	0.1 mV Resolution & Accuracy 10 Volt Range	HP 3455A	A
Pulse Generator	Square wave, 0.5V P-P, 1 kHz Repetition Rate Rise time 35 ns maximum	HP 8013B	A, P
Oscilloscope	100 MHz Bandwidth	HP 1740A	A, P
Power Supply	Regulation-load effect 5 mV Source effect 3 mV Range 0—1.5V minimum Periodic and Random Deviation 200 μ V rms	HP 6203B	A
50 Ω Potentiometer	Non-wirewound 0.25W	HP 2100-0671	A
Sweep Oscillator Mainframe	0.1—18 GHz	HP 8620C	P
RF Plug-in	0.1—18 GHz	HP 86290A	P
Microwave Amplifier	Full band coverage to 18 GHz or Frequency of interest 200 mW output	HP 489A, 491C, 493A, 495A	P
Dual Directional Coupler	20 dB attenuation on reflected and incident ports. 2—18 GHz frequency >26 dB directivity	HP 11692D	P
Power Meter	0.1—18 GHz, 1 mW to 100 mW	HP 436A	P
Power Sensor	0.1—18 GHz, 1 mW to 100 mW	HP 8481A	P
Coaxial Attenuator	10 dB attenuation 2W average, 100W peak	HP 8491B (Opt. 010)	P
Coaxial Step Attenuator	0.1—18 GHz 1 dB step, 11 dB total	HP 8494B	P
Power Splitter	Dc—18 GHz 0.5W input	HP 11667A	P
Power Sensor	0.1—18 GHz, 0.1 mW—3W 100W Peak	HP 8481H	P
Coaxial Crystal Detector	0.1—18 GHz 0.5 mV/ μ W minimum 200 mW input	HP 8470B	P
P = Performance; A = Adjustments; T = Troubleshooting			

Table 1-3. Recommended Test Equipment (2 of 2)

Instrument Type	Critical Specifications	Suggested Model	Use*
Pulse Modulator	2—18 GHz Rise and fall time <10 ns	HP 11720A	P
System Voltmeter	0.001V resolution 1.0V full scale Settling time = 1.5 μ s Delay 0.1 μ s	HP 3437A	P
Type N Coaxial Short	Type N 50 Ω	HP 11512A	P
Peak Power Sensor	No substitution	HP 84811A	P
Low Pass Filter	Cut-off frequency in GHz 2.8 4.4 6.8 9.5 13.0	P HP 11688A HP 11689A HP 11684A HP 11685A HP 11686A	
P = Performance; A = Adjustments; T = Troubleshooting			

SECTION II INSTALLATION

2-1. INTRODUCTION

This section provides information about incoming inspection, selecting the input line voltage, operating environment, and information applicable to bench mounting.

2-2. INITIAL INSPECTION

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment are shown in Figure 1-1 and the procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defects, or if the instrument does not pass the electrical performance test, notify the nearest Hewlett-Packard office. If the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection.

2-3. PREPARATION FOR USE

2-4. Power Requirements

The Peak Power Meter requires a power source of 100, 120, 220 or 240 Vac $\pm 5\%$ -10% , 48 to 66 Hz single phase. Power consumption is less than 10 VA.

2-5. Line Voltage and Fuse Selection

Verify that the line voltage selection card and the fuse are matched to the power source. Figure 2-1 provides instructions for line voltage selection.

CAUTION

Before plugging this instrument into the mains (line) voltage, be sure the correct voltage and fuse have been selected, otherwise damage can occur to the instrument.

NOTE

The correct fuse rating for the line voltage is shown on the fuse compartment. More information is given in Table 3-1 Power Line Fuse Information.

2-6. Power Cable

In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. Refer to Figure 2-2 for the part numbers of the power cable plugs available.

WARNINGS

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection). In addition, verify that a common ground exists between the unit under test and this instrument prior to energizing either unit.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction), make sure the common terminal is connected to neutral (that is, the grounded side of the mains supply).

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.). Do not use repaired fuses or short circuited fuseholders.

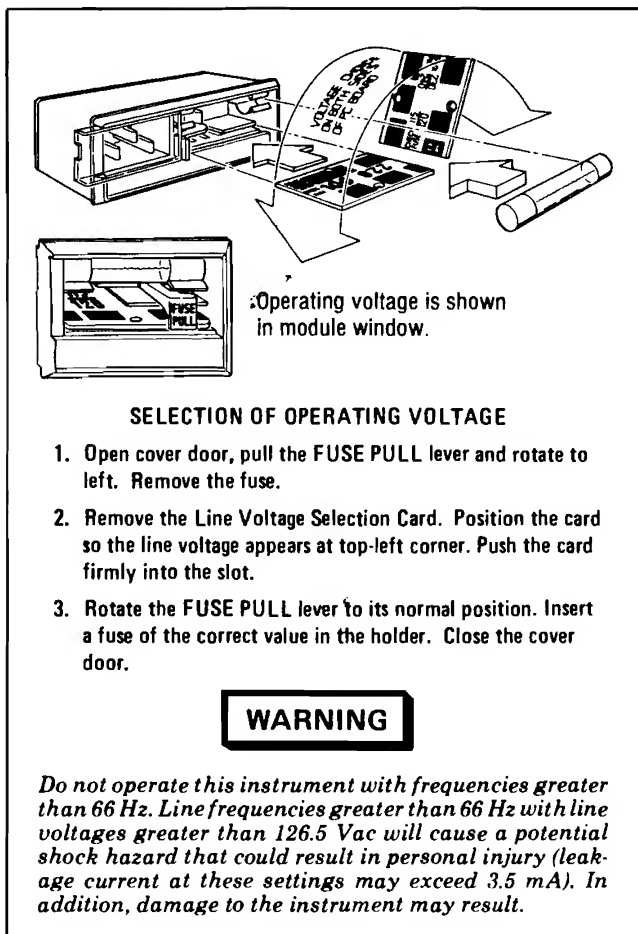


Figure 2-1. Line Voltage Selection

2-7. Interconnections

The Power Meter and a power sensor are integral parts of this measurement system. Before measurements can be performed, the Power Meter and sensor must be connected together with the power sensor cable.

2-8. Mating Connectors

Mating connectors used with the Peak Power Meter should be one of the following:

1. 50 ohm type BNC male
2. Five pin lock-ring male

2-9. Operating Environment

The operating environment should be within the following limitations:

Temperature 0 to +55°C
 Humidity ... <95% relative humidity at 40°C
 Altitude <4600 metres (15 000 feet)

2-10. Bench Operation

The instrument cabinet has plastic feet and fold-away tilt stand for convenience in bench operation. The plastic feet are shaped to ensure self-aligning of the instruments when stacked. The tilt stands raise the front of the instrument for easier viewing of the control panel.

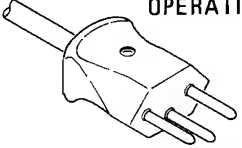
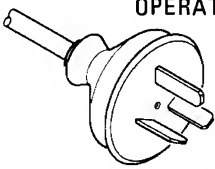
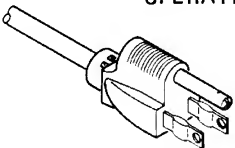
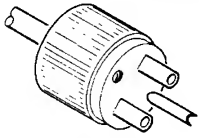
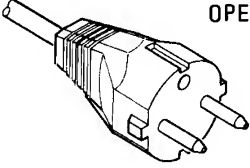
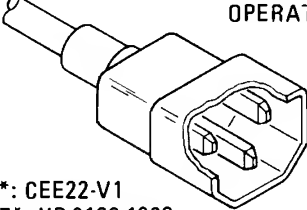
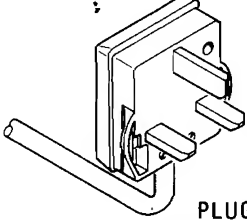
 <p>220/240V OPERATION</p> <p>PLUG*: SEV 1011.1959-24507 TYPE 12 CABLE*: HP 8120-2104</p>	 <p>220/240V OPERATION</p> <p>PLUG*: NZSS 198/AS C112 CABLE*: HP 8120-1369</p>	 <p>100/120V OPERATION</p> <p>PLUG*: NEMA 5-15P CABLE*: 8120-1378</p>	 <p>220/240V OPERATION</p> <p>PLUG*: NEMA 6-15P CABLE*: HP 8120-0698</p>
 <p>220/240V OPERATION</p> <p>PLUG*: CEE7-VII CABLE*: HP 8120-1689</p>	 <p>220/240V OPERATION</p> <p>PLUG*: CEE22-V1 CABLE*: HP 8120-1860</p>	 <p>220/240V OPERATION</p> <p>PLUG*: BS 1363A CABLE: HP 8120-1351</p>	
<p>*The number shown for the plug is the industry identifier for the plug only. The number shown for the cable is an HP part number for a complete cable including the plug.</p>			

Figure 2-2. Power Cables Available

2-11. STORAGE AND SHIPMENT**2-12. Storage Environment**

The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment.

Temperature -40 to +75°C
Humidity <95% relative humidity at 40°C
Altitude <7600 metres (25 000 feet)

2-13. Packaging

Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a blue tag (found at the back of this manual), indicating the type of service required, return address, model number, and full serial number. Also mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging. The following general instructions should be used for re-packaging with commercially available materials:

- a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach a blue tag indicating the type of service required, return address, model number, and full serial number.)
- b. Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.
- c. Use enough shock-absorbing material (3 to 4-inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard.
- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to assure careful handling.

SECTION III OPERATION

3-1. INTRODUCTION

This section describes the functions of the controls and indicators of the Peak Power Meter. It describes how to set the front and rear panel controls, and covers such operator maintenance as fuses and indicator lamp replacement.

3-2. PANEL FEATURES

Front panel controls, indicators, and connectors are shown and described in Figure 3-1. Rear panel controls and connectors are shown and described in Figure 3-2.

3-3. OPERATOR'S CHECKS

Use the operator's checks in Figure 3-3 to verify proper operation of the Peak Power Meter's main functions.

3-4. OPERATING INSTRUCTIONS

Figure 3-4 explains how to use the Peak Power Meter.

3-5. POWER MEASUREMENT ACCURACY

A power measurement is never free from error or uncertainty. Any RF system has RF losses, mismatch losses, harmonics, mismatch uncertainty, instrumentation uncertainty and calibration uncertainty. Measurement errors as high as 50% are not only possible, they are highly likely unless the error sources are understood and, as much as possible, eliminated.

3-6. SOURCES OF ERROR AND MEASUREMENT UNCERTAINTY

3-7. RF Losses

Some of the RF power that enters the power sensor is not dissipated in the power sensing elements. This RF loss is caused by dissipation in the center conductor of coaxial power sensors, in the dielectric of capacitors, in radiation losses and connections within the sensor diode caused by shunt conductance and junction capacitance.

3-8. Mismatch

The result of mismatched impedance between the device under test and the power sensor is that some

of the power fed to the sensor is reflected before it is dissipated in the load. Mismatches affect the measurement in two ways. First, the initial reflection is simple loss and is called mismatch loss. Second, the power reflected from the sensor mismatch travels back up the transmission line until it reaches the source. There, most of it is dissipated in the source impedance, but some of it is re-reflected by the source mismatch. The re-reflected power returns to the power sensor and adds to, or subtracts from, the incident power. For all practical purposes, the effect the re-reflected power has upon the power measurement is unpredictable. This effect is called mismatch uncertainty.

3-9. Instrumentation Uncertainty

Instrumentation uncertainty describes the ability of the metering circuits to accurately measure the dc output from the power sensor's power sensing device. In the Peak Power Meter, this error is less than ± 0.35 dB. It is important to realize, however, that a ± 0.35 dB meter does not automatically give ± 0.35 dB overall measurement accuracy.

3-10. Specified Uncertainties

The specified uncertainties which account for part of the total power measurement uncertainty are:

a. 8900C instrumentation uncertainty

Meter Accuracy	CW	Pulse	Transfer Accuracy CW to Pulse
Direct	± 0.2 dB	± 0.35 dB	± 0.2 dB
Compare	± 0.2 dB	± 0.25 dB	± 0.1 dB

b. 84811A calibration uncertainty

(+10 to 40°C)
 ± 0.7 dB 0.1 GHz to 12 GHz
 ± 1.0 dB 12 GHz to 18 GHz
 (0–10°C and 40–55°C add ± 0.2 dB).

3-11. Calculating Mismatch Uncertainty

Mismatch uncertainty is the result of the source mismatch interacting with the power sensor mismatch. The magnitude of uncertainty is related to the magnitudes of the source and power sensor reflection coefficients, which can be calculated from

Calculating Mismatch Uncertainty (Cont'd)

SWR. Figure 3-6 shows how the calculations are made and Figure 3-7 illustrates mismatch uncertainty and total calculated uncertainty for two cases. In the first case, the power sensor's SWR is 1.5, and in the second case, the power sensor's SWR is 2.0. In both cases the source has an SWR of 2.0. The example shows the effect on power measurement accuracy a poorly matched power sensor will have as compared to one with low mismatch.

A faster, easier way to find mismatch uncertainty is to use the HP Mismatch Error (uncertainty) Limits/Reflectometer Calculator. The calculator may be obtained, on request, from your nearest Hewlett-Packard office by using HP part number 5952-0948.

The method of calculating measurement uncertainty from the uncertainty in dB is shown by Figure 3-8. This method would be used when the initial uncertainty calculations were made with the Mismatch Error/Reflectometer Calculator.

3-12. CORRECTIONS FOR ERROR

3-13. Correction Factor

The peak power sensor used with the Peak Power Meter has an individually calibrated correction factor table printed on its cover. To correct for sensor frequency response, simply find the power sensor's correction factor at the measurement frequency from the table that is supplied with the power sensor, and set the CORRECTION switch to this value.

3-14. Transfer Function of the Diode Current versus Input Voltage

At low levels the output current is proportional to the square of the applied voltage. At high levels the output current is directly proportional to the input voltage. Each diode varies slightly in the precise transfer function uncertainty. The Peak Power Meter's response is shaped for the average diode. The maximum error for an 84811A diode transfer function is ± 0.7 dB to 12 GHz; ± 1.00 dB to 18 GHz.

Transfer uncertainty can be reduced by calibrating the meter and sensor at the frequency and power of interest.

Meter and sensor are connected to an rf source of known frequency and precise power level at CW. The CORRECTION switch is then adjusted until

the Peak Power Meter displays the known power level. The meter is now calibrated to measure a pulsed signal at the CW frequency and the known power level.

The transfer uncertainty from CW to pulse is <0.2 dB for the Peak Power Meter and 84811A peak power sensor. The overall CW to pulse transfer uncertainty must also include the level uncertainty of the CW calibration source, the mismatch error between the sensor and CW source and the mismatch error between the sensor and pulsed rf source.

3-15. OPERATOR'S MAINTENANCE

CAUTION

Be sure to select the correct fuse rating for the selected line voltage (see LINE VOLTAGE SELECTION in Section II and Power Line Fuse information in Table 3-1.

3-16. Power Line Fuse

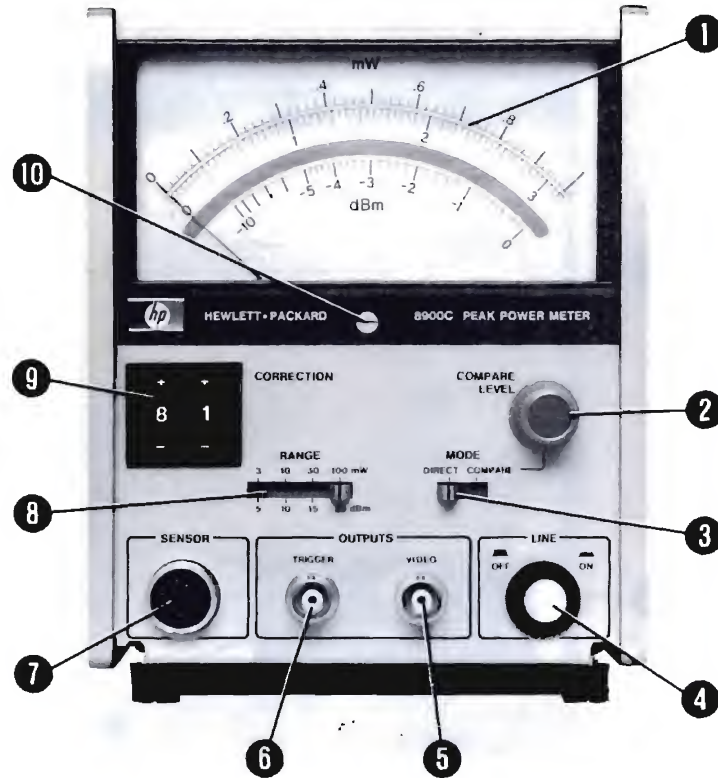
The main ac line fuse is located on the rear panel next to the line power cable jack. To remove the fuse, first remove the line power cable from its jack. Slide the fuse compartment cover to the left, then pull the handle marked FUSE PULL and remove the fuse. See Table 3-1 for replacement fuse information.

* Table 3-1. Power Line Fuse Information

Operation	Description	HP Part Number
100—120V	.1A 250V	2110-0234
200—240V	.062A 250V	2110-0311

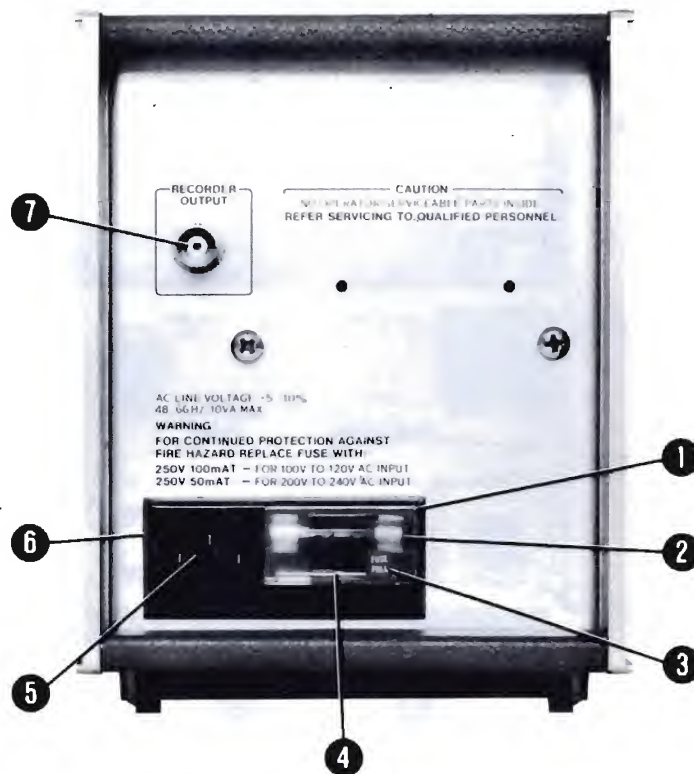
3-17. Lamp Replacement

The lamp is contained in a plastic lens which doubles for a pushbutton on the LINE switch. When the Power Meter LINE switch is ON and is being operated by the available line power, the lamp should be illuminated. If the lamp is defective, remove the lens by pulling it straight out. Order lamp (3131-0434) (CD6) and replace the old pushbutton-lamp assembly with the new one. To replace the assembly, align the pins with the notch in the receptacle and push straight in.



- 1 Meter.** Normally indicates peak rf power in mW and dBm.
- 2 COMPARE LEVEL.** When in compare mode the COMPARE LEVEL is used to measure power at user selected points on the pulse waveform. This is accomplished by adjusting the COMPARE LEVEL which in turn moves a reference line up or down on the pulse waveform as seen on an oscilloscope.
- 3 MODE switch.** Selects either DIRECT or COMPARE mode. In DIRECT mode the meter automatically displays the maximum rf power with no user adjustments and no external instruments. In COMPARE mode, the meter is disconnected from the peak detecting circuit and instead indicates power corresponding to the position of a reference line.
- 4 LINE switch.** Connects the line power to the Power Meter circuits when the LINE switch is on. The lamp contained within the LINE switch will be illuminated when the instrument is on. Both sides of the mains line goes through the switch.
- 5 VIDEO OUTPUT.** Provides detected input signal and reference line used in compare mode. Not linear with power. Nominal impedance 50Ω. BNC connector. Typical output voltage for 1 mW input is 30 mV. Dc coupled.
- 6 TRIGGER OUTPUT.** Provides the trigger signal for the test oscilloscope. Typical output voltage >0.1V peak. Nominal impedance 50Ω. BNC connector.
- 7 SENSOR Input.** Five pin lock-ring connector which serves as the input to the Power Meter from the power sensor. This connector also serves as the supply for the plus and minus five (5) volts to the sensor.
- 8 RANGE switch.** Sets the range of the Power Meter to either 3, 10, 30, or 100 mW maximum range.
- 9 CORRECTION switch.** Used to set the correction factor of the frequency where the measurement is to be taken. The correction factor data versus frequency is found on the peak power sensor.
- 10 METER ZERO.** Mechanical adjustment used to zero the meter when the LINE switch in ON.

Figure 3-1. Front Panel Controls, Indicators and Connectors



- | | |
|---|---|
| <p>1 Window. Safety interlock; fuse cannot be removed while power cable is connected to Power Meter.</p> <p>2 Fuse. Refer to Table 3-1 for values.</p> <p>3 Fuse Pull Handle. Mechanical interlock to guarantee fuse has been removed before line voltage selection card can be removed.</p> <p>4 Line Voltage Selection Card. Matches transformer primary to available line voltage.</p> | <p>5 Receptacle. For power cable connection to available line voltage.</p> <p>6 Power Module Assembly.</p> <p>7 RECORDER OUTPUT. 0—1 Vdc linearly proportional to the indicated power on each range. Output impedance 1 KΩ, BNC connector.</p> |
|---|---|

Figure 3-2. Rear Panel Features

OPERATING INSTRUCTIONS

BEFORE SWITCHING ON THIS INSTRUMENT, check that the power transformer primary is matched to the available line voltage, the correct fuse is installed and safety precautions are taken. See Power Requirement, Line Voltage Selection, Power Cables and associated warnings and cautions in Section II.

WARNING

BEFORE CONNECTING LINE POWER TO THE INSTRUMENT, ensure that all devices connected to this instrument are connected to the protective (earth) ground.

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that the line power (Mains) plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.)

CAUTION

Do not twist the body of the power sensor when connecting or disconnecting it. This can cause major damage to the sensor.

Direct Mode

1. With the LINE switch ON (illuminated) and no input applied, adjust the METER ZERO for a METER reading of zero.
2. Connect the power sensor to the Power Meter with the power sensor cable.
3. Connect the power cable to the power outlet and power module receptacles. Set the LINE switch to ON; the lamp within the switch lens should be lit.
4. Set the MODE switch to DIRECT.
5. Set the CORRECTION switch to the value of the correction factor found on the peak power sensor for the frequency where the measurement is to be taken.
6. Set the RANGE switch to 100 mW. If after a reading has been taken and the power level is less than 100 mW, the operator may wish to change the RANGE to a lower setting to get better resolution.
7. Connect the power sensor to an rf source. Read the power level in mW.

CAUTION

See Operating Precautions in the power sensor Operating and Service Manual for maximum power levels which may be safely coupled to this system. Levels which exceed the limits may damage the power sensor, Power Meter, or both.

Compare Mode

1. Perform steps 1, 2 and 3 as stated above under DIRECT MODE.
2. Set the MODE switch to COMPARE.
3. Set the CORRECTION switch to the value of the correction factor found on the peak power sensor for the frequency where the measurement is to be taken.
4. Set the RANGE switch to 100 mW. If after a reading has been taken and the power level is less than 100 mW, the operator may wish to change the RANGE to a lower setting to get better resolution.
5. Connect the TRIGGER OUTPUT to the external trigger of an oscilloscope.
6. Connect the VIDEO OUTPUT to the vertical input of a dc coupled oscilloscope.
7. Connect the power sensor to an rf source. Read the power level in mW.
8. Adjust the scope for a clear display of the pulse waveform and the reference line.
9. It is now possible to measure power at any point on the pulse waveform. Adjust the COMPARE LEVEL to move the reference line, as seen on the scope, to the position on the pulse waveform that is of interest. The Power Meter will then display the power at that point.

Figure 3-4. Operating Instructions

SECTION IV PERFORMANCE TESTS

WARNINGS

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection). In addition, verify that a common ground exists between the unit under test and this instrument prior to energizing either unit.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction), make sure the common terminal is connected to neutral (that is, the grounded side of the mains supply).

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.). Do not use repaired fuses or short circuited fuseholders.

4-1. INTRODUCTION

The procedures in this section test the electrical performance of the Peak Power Meter using the specifications of Table 1-1 as performance standards. All tests can be performed without access to the interior of the instrument. A simpler operational test is included in Section III under Operator's Checks.

4-2. EQUIPMENT REQUIRED

Equipment required for the performance tests is listed in Table 1-3, Recommended Test Equipment. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended model(s).

4-3. TEST RECORD

Results of the performance tests may be tabulated on the Test Record at the end of the test procedures. The Test Record lists all of the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance, troubleshooting and after repairs or adjustments.

4-4. PERFORMANCE TESTS

The performance tests given in this section are suitable for incoming inspection, troubleshooting or preventive maintenance. During any performance test, all shields and connecting hardware must be in place. Perform the tests in the order given and record the data on the test card and/or in the data spaces provided at the end of each procedure.

NOTE

The Peak Power Meter must have a half-hour warmup and the line voltage must be within +5%, -10% of nominal if the performance tests are to be considered valid.

Each test is arranged so that the specification is written as it appears in Table 1-1. Next, a description of the test and any special instructions or problem areas are included. Each test that requires test equipment has a setup drawing and a list of the required equipment. The initial steps of each procedure give control settings required for that particular test.

PERFORMANCE TESTS

4-5. PEAK POWER SENSOR PERFORMANCE TEST (Return Loss)

SPECIFICATION SWR: 100 MHz to 12 GHz < 1.5
 12 GHz to 18 GHz < 2.0

DESCRIPTION To verify SWR specifications a Return Loss Test is performed. The Return Loss Test may be run without the Peak Power Sensor being connected to the Peak Power Meter. A microwave source is connected by appropriate attenuation to a dual directional coupler. The Peak Power Sensor is connected to the test port of the directional coupler. The incident and reflected ports of the directional coupler are connected to power meters. From the power measurements made on the incident and reflected ports, Return Loss can be calculated.

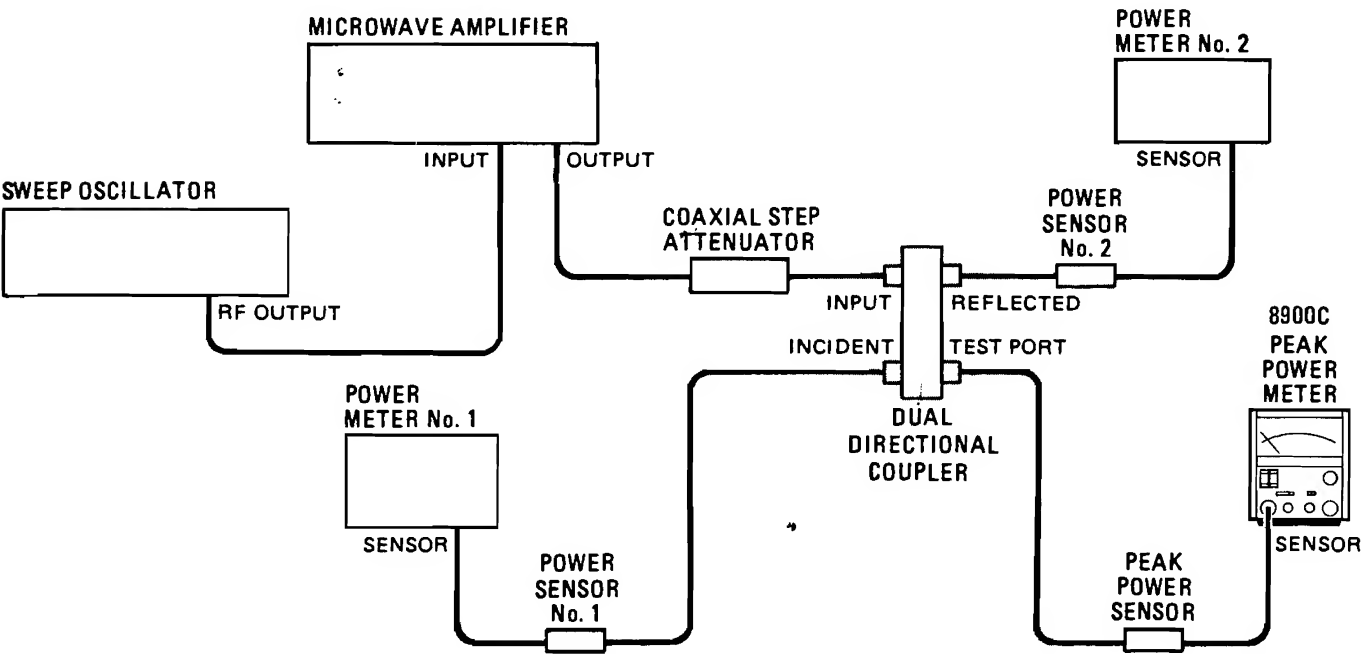


Figure 4-1. Peak Power Sensor Performance Test (Return Loss)

EQUIPMENT	Sweep Oscillator Mainframe	HP 8620C
	RF Plug-in	HP 86290A
	Microwave Amplifier	HP 489A, 491C, 493A, 495A
	Coaxial Step Attenuator (1 dB/step)	HP 8494B
	Dual Directional Coupler	HP 11692D
	Power Meter (2 required)	HP 436A
	Power Sensor (2 required)	HP 8481A
	Coaxial Attenuator (10 dB)	HP 8491B Opt. 010
	Type N Coaxial Short	HP 11512A
	Type N Coaxial Open (made from the following parts):	HP 1250-0196 Body, HP 1250-0016 Snap Ring, HP 1250-0198 Nut

PERFORMANCE TESTS

4.5 PEAK POWER SENSOR PERFORMANCE TEST (Return Loss) (cont'd)**NOTES**

Use the appropriate microwave amplifier depending on the frequency of interest.

The type N coaxial open is required only for measurements above 10 GHz.

PROCEDURE:

1. Set the coaxial step attenuator to 11 dB of attenuation. Connect the equipment as shown in Figure 4-1. Allow at least one half hour for the equipment to warm up. Then before doing the performance test, be sure the test port output of the coupler is less than 100 mW.

2. Set the sweep oscillator to CW, and set to the frequency of interest. Make sure that the microwave amplifier is compatible with the frequency of the sweep oscillator.

Frequency of interest _____

3. Using the 10 dB coaxial attenuator connected to the test port of the dual directional coupler, measure the power output with power meter #2. Adjust the sweep oscillator and/or the microwave amplifier for +10 dBm at the attenuator output. Read and record the power level of power meter #1. This value is the incident wave reference level. Remove the attenuator and connect power meter #2 to the reflected port of the dual directional coupler.

Power Meter #1 (Incident Wave Reference Level) _____

4. Terminate the test port of the dual directional coupler with a type N open constructed from the parts listed in the equipment list. It is not necessary to use this non-radiating open if operating below 10 GHz. Readjust the source so that the reading on power meter #1 is equal to the incident wave reference level measured in step #3. Measure and record the power level using power meter #2, at the reflected port.

Power Meter #2 (reflected port) _____

5. Terminate the test port with a type N coaxial short. Readjust the source so that the reading on power meter #1 is equal to the incident wave reference level measured in step #3. Measure and record the power level at the reflected port as in the previous step.

Power Meter #2 (reflected port) _____

6. Compute the average power measured on power meter #2 in steps 4 and 5 above. This value is the return loss reference.

Return loss reference _____

7. Connect the Peak Power Sensor and Peak Power Meter to the test port. Using power meter #1, monitor the power level at the incident port and adjust to the same level as in step 3 if necessary.

8. Read and record the power level indicated on power meter #2.

Power Meter #2 _____

PERFORMANCE TESTS

4-5. PEAK POWER SENSOR PERFORMANCE TEST (Return Loss) (cont'd)

9. Determine and record the maximum error of the test system using the following data:

Test Frequency	Error
100 MHz to 8 GHz	1.5 dB
8 GHz to 12 GHz	2.1 dB
12 GHz to 18 GHz	1.4 dB

Error _____ dB

10. Compute the return loss for D.U.T. using the following formula.

$$\begin{aligned} & (\text{Power Meter \#2 reading} - \text{step 8}) \text{ _____} \\ & - (\text{Return Loss Reference} - \text{step 6}) \text{ _____} \\ & + (\text{Maximum Error of test system} - \text{Step 9}) \text{ _____} \end{aligned}$$

Return Loss of D.U.T. _____

For frequencies between 100 MHz and 12 GHz return loss for D.U.T. must be > 14 dB (or < 1.5 SWR).

For frequencies between 12 GHz and 18 GHz the return loss for D.U.T. must be > 9.55 dB (or < 2.0 SWR).

PERFORMANCE TESTS

4-6. PEAK POWER MEASUREMENT SYSTEM PERFORMANCE TESTS

SPECIFICATIONS: Meter accuracy, CW: ± 0.2 dB

Sensor accuracy: ± 0.7 dB 0.1 to 12 GHz
 ± 1.0 dB 12 GHz to 18 GHz

Rise time: 75 ns

Fall time: 125 ns

Pulse response

Pulse width: 1 μ s to CW

Repetition rate: 100 Hz to 100 kHz

Transfer accuracy

CW to Pulse: ± 0.2 dB

DESCRIPTION: The Peak Power Meter is tested for accuracy using a CW microwave signal and comparing the result against the power measured by a known calibrated power meter.

Pulsed rf accuracy is measured by monitoring the value of the detected voltage of a high duty cycle signal, and measuring the peak power. The duty cycle is then reduced to a very low value. Next, readjusting the power level to obtain the same value of detected voltage assures that the peak power level is the same as with the high duty cycle. The power level is then read on the Peak Power Meter and compared with the reading obtained on the high duty cycle pulse.

Rise and fall times of the detected pulse are checked by monitoring these parameters with an oscilloscope.

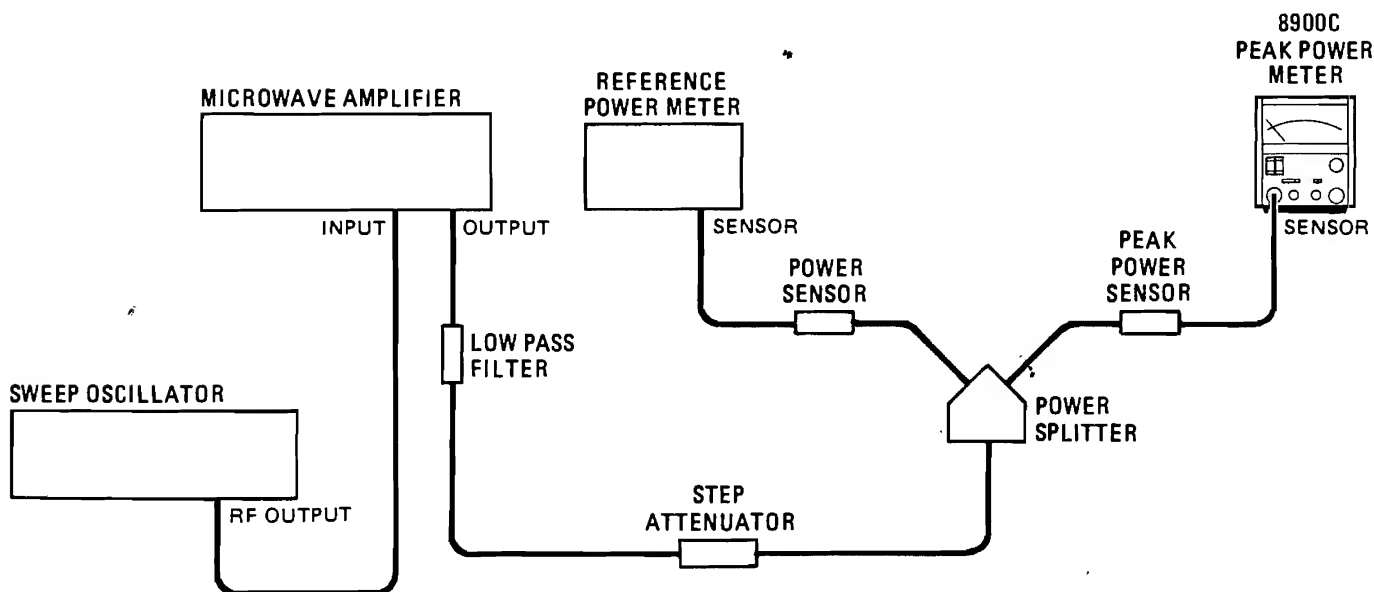


Figure 4-2. CW Power Measurement Accuracy

PERFORMANCE TESTS

4-6. PEAK POWER MEASUREMENT SYSTEM PERFORMANCE TESTS (cont'd)

EQUIPMENT:	Sweep Oscillator Mainframe	HP 8620C
	RF Plug-in	HP 86290A
	Microwave Amplifier	HP 489A, 491C, 493A, 495A
	Coaxial Step Attenuator (1 dB/step)	HP 8494B
	Power Splitter	HP 11667A
	Power Meter	HP 436A
	Power Sensor	HP 8481H
	Coaxial Attenuator (10 dB)	HP 8491B Opt. 010
	Coaxial Crystal Detector	HP 8470B
	Pulse Generator	HP 8013B
	Pulse Modulator	HP 11720A
	Oscilloscope	HP 1740A
	System Voltmeter	HP 3437A
	Peak Power Sensor	HP 84811A
	Low Pass Filter	HP 11688A, 11689A, 11684A, 11685A, 11686A

NOTE

Use the appropriate microwave amplifier(s) depending on the frequency of interest.

PROCEDURE: CW POWER ACCURACY, DIRECT MODE

1. Set up the equipment as shown in figure 4-2.
2. Set the CORRECTION switch on the Peak Power Meter to the value specified on the peak power sensor for the frequency of interest.
3. Set the Peak Power Meter to the 3 mW RANGE.
4. Set the attenuator to maximum attenuation (11 dB).
5. Turn on all equipment and allow at least one half hour warmup period.
6. Calibrate the reference power meter, and set it to read in dBm.
7. Adjust the signal source power output for a reading of 1 mW on the Peak Power Meter. Read the reference power meter. Repeat the above measurement at 5, 10, 50, and 100 mW. Adjust the RANGE of the Peak Power Meter so that the display does not overrange for each power setting. The power meter should read as follows:

The meter accuracy at CW is ± 0.2 dB.

The sensor has an accuracy of ± 0.7 dB, 0.1 to 12 GHz, and ± 1.0 dB, 12 GHz to 18 GHz. By adding the two accuracy specifications the test specification is arrived at.

PERFORMANCE TESTS

4-6. PEAK POWER MEASUREMENT SYSTEM PERFORMANCE TESTS (cont'd)

Frequency	Peak Power Meter Reading	Reference Power Meter Reading	Test Specifications
0.1—12 GHz	1 mW	_____	0 dBm \pm 0.9 dB
	5 mW	_____	7 dBm \pm 0.9 dB
	10 mW	_____	10 dBm \pm 0.9 dB
	50 mW	_____	17 dBm \pm 0.9 dB
	100 mW	_____	20 dBm \pm 0.9 dB
12 to 18 GHz	1 mW	_____	0 dBm \pm 1.2 dB
	5 mW	_____	7 dBm \pm 1.2 dB
	10 mW	_____	10 dBm \pm 1.2 dB
	50 mW	_____	17 dBm \pm 1.2 dB
	100 mW	_____	20 dBm \pm 1.2 dB

CW POWER ACCURACY, COMPARE MODE

1. Keeping the same test setup as above, connect the VIDEO output from the Peak Power Meter to the oscilloscope's A channel. Set the oscilloscope to 10 ms/div and 0.05 volts/div. Set the signal level for a full scale reading on the Peak Power Meter of 10 mW. Set the Peak Power Meter to COMPARE mode. Adjust the COMPARE LEVEL control so the two lines shown on the oscilloscope converge to form one line. The display on the Peak Power Meter should be within 0.2 dB of the reading in DIRECT mode.

Reading Direct	Reading Compare	Specification
10 mW	_____	+9.55 to +10.47 mW

2. Repeat the procedure using 100 mW.

Reading Direct	Reading Compare	Specification
100 mW	_____	+95.5 to +104.7 mW

PERFORMANCE TESTS

4-6. PEAK POWER MEASUREMENT SYSTEM PERFORMANCE TESTS (cont'd)

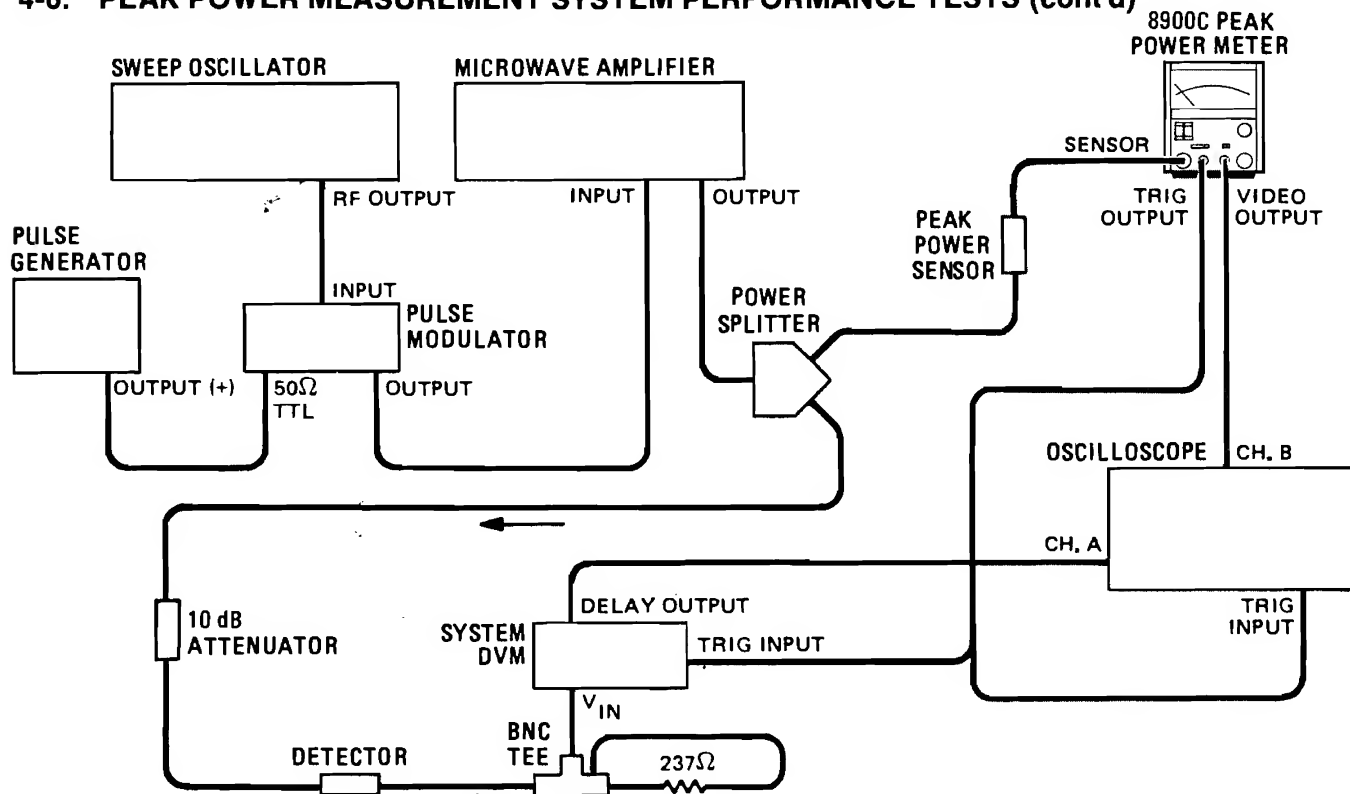


Figure 4-3. Peak Power Measurement Accuracy

VIDEO PULSE RISE/FALL TIME

1. Reconfigure the test setup as in Figure 4-3. Set the step attenuator to maximum attenuation. Set the pulse generator for $10\ \mu\text{s}$ pulsewidth, and 1 kHz repetition rate. Set the Peak Power Meter to DIRECT mode. Adjust the frequency slightly to obtain the sharpest looking square wave on the oscilloscope. This adjustment will compensate for mismatch and standing waves.

2. Measure the rise and fall times of the video output pulse between the 10 and 90% points. The rise time should be less than 75 ns, and the fall time should be less than 125 ns.

Rise _____ < 75 ns

Fall _____ < 125 ns

PULSE POWER ACCURACY

1. Reconfigure the test setup as shown in Figure 4-3. Adjust the pulse generator for a +5 volt pk output, 100 Hz repetition rate and $1\ \mu\text{s}$ pulse width. Adjust the sweep oscillator for 6 GHz, or the frequency of interest. Adjust the signal source for an indicated power level of 100 mW on the Peak Power Meter. Set the oscilloscope to 10 ms/div, channel A (video out) to 0.5 V/div and channel B (delay out) to 5 V/div. Set the oscilloscope's trigger to external and positive, and set the display mode to chop. The pulse modulator should be set to normal, 50Ω TTL. Set the system voltmeter to external trigger, 1 volt range and delay equal to 0.000002 seconds. Adjust the sweep oscillator frequency slightly to obtain the squarest pulse with no overshoot.

PERFORMANCE TESTS

4-6. PEAK POWER MEASUREMENT SYSTEM PERFORMANCE TESTS (cont'd)

2. Reset the pulse generator for approximately 9.5 ms pulse width. This corresponds to 95% duty cycle (95% is an approximation of CW). Readjust the signal source output level for a displayed power of 100 mW on the Peak Power Meter.

3. Vary the delay of the pulse generator while monitoring the system voltmeter. Note and record the peak negative value.

Peak Negative Value _____

4. Change the oscilloscope sweep speed to $0.5 \mu\text{s}/\text{div}$. Reduce pulse generator delay to minimum, and set the pulse width to $1 \mu\text{s}$ wide at the 90% points on the detected waveform.

5. Vary the delay of the pulse generator while monitoring the system voltmeter, and set to peak negative value. Adjust the signal source output so that the reading of the system voltmeter is equal to that of step 3. Note the reading of the Peak Power Meter. The difference between this reading and the value set in step 2 should be within +4.7%, -4.5%, that is $\pm 0.2 \text{ dB}$.

Specification

(Step 2 _____) - (Step 5 _____) = _____ +95.5 to +104.7 mW

6. Reset the power level to 10 mW. Remove the 10 dB attenuator from between the power splitter and the coaxial detector. Repeat steps 2 through 5 using the new power level. The same specifications apply.

Peak Negative Value _____

Specification

(Step 2 _____) - (Step 5 _____) = _____ +9.55 to +10.47 mW

7. Insert the 10 dB attenuator between the peak power sensor and the power splitter. This reduces the power to the peak power sensor to 1 mW. Repeat steps 2 through 5 using the 1 mW power level. The same specifications apply.

Peak Negative Value _____

Specification

(Step 2 _____) - (Step 5 _____) = _____ +.955 to +1.047 mW

Table 4-1. Performance Test Record (1 of 2)

Hewlett-Packard Company				
Model 8900C		Tested By _____		
Peak Power Meter				
Serial Number _____		Date _____		
Para No.	Test Description	Results		
		Min	Actual	Max
4-5.	PEAK POWER SENSOR PERFORMANCE TEST (Return Loss)			
	Step 2 Frequency of interest _____			
	Step 3 Power Meter #1 _____ (Incident Wave Reference Level)			
	Step 4 Power Meter #2 _____ (Reflected port)			
	Step 5 Power Meter #2 _____ (Reflected port)			
	Step 6 Return Loss Reference _____			
	Step 8 Power Meter #2 _____			
	Step 9 Error _____ dB			
	Step 10 Return Loss of D.U.T.			
		14 dB (100 MHz to 12 GHz)	_____	
	9.55 dB (12 GHz to 18 GHz)	_____		

Table 4-1. Performance Test Record (2 of 2)

Sect. No.	Test Description	Results		
		Min	Actual	Max
4-6.	PEAK POWER MEASUREMENT SYSTEM PERFORMANCE TESTS			
	CW Power Accuracy, Direct Mode			
	Frequency			
	Peak Power Meter Reading			
	0.1 to 12 GHz			
	1 mW	-0.9 dBm	_____ dBm	+0.9 dBm
	5 mW	+6.1 dBm	_____ dBm	+7.9 dBm
	10 mW	+9.1 dBm	_____ dBm	+10.9 dBm
	50 mW	+16.1 dBm	_____ dBm	+17.9 dBm
	100 mW	+19.1 dBm	_____ dBm	+20.9 dBm
	12 GHz to 18 GHz			
	1 mW	-1.2 dBm	_____ dBm	+1.2 dBm
	5 mW	+5.8 dBm	_____ dBm	+8.2 dBm
	10 mW	+8.8 dBm	_____ dBm	+11.2 dBm
	50 mW	+15.8 dBm	_____ dBm	+18.2 dBm
	100 mW	+18.8 dBm	_____ dBm	+21.2 dBm
	CW Power Accuracy, Compare Mode			
	Step 1			
	Reading, Direct			
	10 mW	+9.55 mW	_____ mW	+10.47 mW
	Step 2			
	Reading, Direct			
	100 mW	+95.5 mW	_____ mW	+104.7 mW
	Video Pulse Rise/Fall Time			
	Step 2			
	Rise time		_____ ns	75 ns
	Fall time		_____ ns	125 ns
	Pulse Power Accuracy			
	100 mW			
	Step 3			
	Peak Negative Value _____			
	Step 5			
	(Step 2 _____) - (Step 5 _____) =	+95.5 mW	_____ mW	+104.7 mW
	10 mW			
	Step 6			
	Peak Negative Value _____			
	(Step 2 _____) - (Step 5 _____) =	+9.55 mW	_____ mW	+10.47 mW
	1 mW			
	Step 7			
	Peak Negative Value _____			
	(Step 2 _____) - (Step 5 _____) =	+0.955 mW	_____ mW	+1.047 mW

SECTION V ADJUSTMENTS

WARNINGS

Any interruption of the protective (grounding) conductor, (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection). In addition, verify that a common ground exists between the unit under test and this instrument prior to energizing either unit.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction), make sure the common terminal is connected to neutral (that is, the grounded side of the mains supply).

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.). Do not use repaired fuses or short circuited fuseholders.

5-1. INTRODUCTION

This section describes the adjustments which will return the Peak Power Meter to peak operating condition. The adjustments are to be performed whenever performance test results are out of tolerance. This may occur over a period of time because of aging of components within the instrument or because of repair or replacement of certain components, parts or assemblies. Information is provided in this section about the equipment required to perform the tests.

An adjustment procedure includes reference to service sheets where the adjustable components are shown, a description of the test including any problem areas or special instructions, a test equipment setup diagram (if necessary), test equipment recommended for the test, and a step-by-step procedure for performing the adjustments. Removal and installation procedures are presented in Section 8. Adjustment locations are shown in photographs on Service Sheets 1 and 2.

The following general information applies to all adjustments unless otherwise indicated.

- a. Half hour warm-up period is required.
- b. Prior to any adjustment, check power supply voltages as indicated on the troubleshooting block diagram.

5-2. EQUIPMENT REQUIRED

The test equipment required for the adjustment procedures is listed in Table 1-3, Recommended Test Equipment. The critical specifications of substitute test instruments must meet or exceed the standards listed in the table if the performance of the Peak Power Meter is to meet the standards set forth in Table 1-1, Specifications.

ADJUSTMENTS

5-3. PEAK POWER METER ADJUSTMENTS

REFERENCE: Service Sheets 1 and 2.

DESCRIPTION: The power supply voltages are set first because they affect all other adjustments. The Zero Offset, 8X Offset and Video Offset adjustments are set next. These adjustments are all accomplished by monitoring the appropriate test point with a digital voltmeter and adjusting the corresponding potentiometer. The Meter adjustment is made by comparing the displayed Peak Power Meter reading with the value shown on the digital voltmeter. The Gain adjustment is made by supplying a known input and adjusting the 8X G potentiometer for the proper voltage.

EQUIPMENT	Digital Voltmeter	HP 3455A
	Pulse Generator	HP 8013B
	Oscilloscope	HP 1740A
	DC Power Supply	HP 6203B
	50 Ohm Variable Resistor	HP 2100-0671

PROCEDURE: METER ZERO AND POWER SUPPLY ADJUSTMENTS

1. With no input to the Peak Power Meter, zero the meter movement by rotating the front panel screwdriver adjustment clockwise until the meter pointer is to the left of zero and moving upscale towards zero. Stop when the pointer is exactly on zero. Rotate the adjustment screw about 3 degrees counterclockwise to free it from the meter suspension. If the pointer moves during this step, repeat the adjustment, using less counterclockwise motion.
2. Turn all equipment on and allow at least one half hour warmup period. Remove top and side covers from the Peak Power Meter.
3. Connect the digital voltmeter between the GND and -5.4V testpoint on the A3 motherboard assembly. Check for a reading of -5.40 ± 0.01 Vdc. If necessary, adjust the -5.4V potentiometer on the A3 assembly to obtain this value.
4. Connect the digital voltmeter probe to the +5.2V testpoint on the A3 motherboard assembly. Check for a reading of $+5.20 \pm 0.01$ Vdc. If necessary, adjust the +5.2V potentiometer on the A3 assembly to obtain this value. Do not adjust either power supply if the voltage is within limits as this will affect all other adjustments.

OFFSET ADJUSTMENTS

1. On the Peak Power Meter, set the CORRECTION control to 50, the MODE switch to DIRECT, and the RANGE switch to 100 mW. Connect a jumper wire between the terminal with the green wire on the CORRECTION control and chassis ground.
2. Connect the digital voltmeter probe to PK DET, testpoint A3TP10. Adjust OFS, on the A3 assembly, for a voltmeter reading of 0.0000 ± 0.0001 Vdc.
3. Connect the digital voltmeter probe to 8X OUT, testpoint A3TP11. Adjust 8X OFS, on the A3 assembly, for a voltmeter reading of 0.0000 ± 0.0005 Vdc.

ADJUSTMENTS

5-3. PEAK POWER METER ADJUSTMENTS (cont'd)

4. Connect the digital voltmeter to the VIDEO OUTPUT on the front panel. Adjust V OFS, on the A3 assembly, for a voltmeter reading of 0.0000 ± 0.0005 Vdc. Disconnect the jumper wire between the CORRECTION control and chassis ground.

CORRECTION CONTROL ADJUSTMENT

1. Connect a 50 ohm potentiometer in series with the negative output of the dc power supply. Adjust the dc power supply and the variable resistor for an output of -0.5562 ± 0.0005 Vdc when applied to the terminal with the green wire on the CORRECTION control.
2. Set the CORRECTION control to 50. Connect the digital voltmeter to PI, A3TP7. The voltmeter should read -0.4164 ± 0.0047 Vdc. Set the CORRECTION control to 0. The voltmeter should now read between -0.2747 and -0.2840 Vdc. Since the instrument is more often used with the CORRECTION set to between 20 and 80 than to zero, it is preferable to have the adjustment at 50 be closer to nominal value than at zero. Adjust COR, on the A1 assembly, with the CORRECTION control set to 50, for the optimum value of -0.4164 Vdc. Check to be sure that the limits at zero are still being met.

GAIN AND OFFSET ADJUSTMENTS

1. With the CORRECTION control set to 50 and .5562 volts applied to the green wire on the CORRECTION control, connect the digital voltmeter to 8X OUT, A3TP11. Adjust 8X G, on the A3 assembly, for a voltmeter reading of 3.000 ± 0.002 Vdc.
2. Set the MODE switch to DIRECT, the CORRECTION control to 50, and the RANGE switch to 100 mW. Connect the digital voltmeter to the rear panel RECORDER OUTPUT. Adjust the dc power supply so that the voltmeter reads 1.000 ± 0.001 Vdc. Set the Meter Adjust potentiometer, on the A3 assembly, so that the Peak Power Meter display reads 100 mW.
3. Set the dc power supply output to -0.0357 ± 0.0002 Vdc. Set the RANGE to 3 mW. Adjust the 10 OFS, on the A2 assembly, for a display of 1.00 ± 0.01 mW on the Peak Power Meter.
4. Set the dc power supply output to -0.1605 ± 0.0002 Vdc. Set the Peak Power Meter to 10 mW RANGE. Adjust the 10 mW GAIN, on the A2 assembly, for a Peak Power Meter display of 10.00 ± 0.01 mW. Repeat steps 3 and 4 as these steps are interactive.
5. Set the RANGE switch to 30 mW. Adjust the 100 OFS, on the A2 assembly, for a reading of 10.00 ± 0.01 mW.

COMPARE MODE ADJUSTMENT

1. Set the RANGE switch to 100 mW. Adjust the dc power supply to give exactly 100 mW indication on the Peak Power Meter. Connect the VIDEO OUTPUT to channel A of the oscilloscope. Connect the TRIGGER OUTPUT to the external trigger of the oscilloscope. Set the oscilloscope controls to 10 ms/div, and 0.05 V/div.

ADJUSTMENTS

5-3. PEAK POWER METER ADJUSTMENTS (cont'd)

2. Set the MODE switch to COMPARE. Adjust the COMPARE LEVEL control so the two traces as displayed on the oscilloscope converge as one. Adjust COMP, on the A3 assembly, for a reading of 100 mW on the Peak Power Meter. It may be necessary to adjust the vertical position control on the oscilloscope to keep the trace in view. Disconnect the dc power supply from the green wire on the CORRECTION switch.

VIDEO OUTPUT PULSE ADJUSTMENT

Set the pulse generator to square wave, approximately 0.5V peak to peak, and 1 kHz repetition rate. (These pulse generator settings are approximate.) Connect the pulse generator output to the green wire terminal on the CORRECTION control. Set the oscilloscope controls to 0.2 volts per cm and 1 μ s per cm. Connect the oscilloscope channel A to the VIDEO OUTPUT. Adjust V PLS, on the A3 assembly, for the sharpest square wave as viewed on the oscilloscope. It may be necessary to adjust the oscilloscope vertical position control to keep the trace in view.

SECTION VI REPLACEABLE PARTS

6-1. INTRODUCTION

This section contains information for ordering replacement parts for the Peak Power Meter. Table 6-1 lists abbreviations used in the parts list and throughout the manual. Table 6-2 lists all replaceable parts in reference designator order. Table 6-3 contains the names and addresses that correspond to the manufacturer's code numbers.

6-2. ABBREVIATIONS

Table 6-1 lists abbreviations used in the parts list, schematics, and throughout the manual. In some cases, two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

6-3. REPLACEABLE PARTS LIST

Table 6-2 is the list of replaceable parts and is organized as follows:

- a. Electrical assemblies and their components in alphanumeric order by reference designation.
- b. Chassis-mounted parts in alphanumeric order by reference designation.
- c. Mechanical parts.
- d. Illustrated parts breakdown.

The information given for each part consists of the following:

- a. The Hewlett-Packard part number.
- b. Part number check digit (CD).
- c. Total quantity (Qty) used in the instrument.
- d. Part description.
- e. Five-digit code that represents a typical manufacturer.

- f. Manufacturer's part number.

NOTE

The total quantity for each part is given only once, that is, at the first occurrence of the part number in the list. The total quantities for optional assemblies are totalled by assembly and not integrated into the standard list.

6-4. ORDERING INSTRUCTION

To order a part listed in the replaceable parts table, include the Hewlett-Packard part number (with the check digit), and the quantity required. Address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

NOTE

Within the USA, it is better to order directly from the HP Parts Center in Mountain View, California. Ask your nearest HP office for information and forms for the "Direct Mail Order System".

6-5. PARTS PROVISIONING

Stocking spare parts for an instrument is often done to insure quick return to service after a malfunction occurs. Hewlett-Packard has a "Spare Parts Kit" available for this purpose. The kit consists of selected replaceable assemblies and components for this instrument. The contents of the kit and the "Recommended Spares" list are based on failure reports and repair data, and parts support for one year. A complimentary "Recommended Spares" list for this instrument may be obtained on request, and the "Spare Parts Kit" may be ordered through your nearest Hewlett-Packard office.

Table 6-1. Reference Designations and Abbreviations (1 of 2)

REFERENCE DESIGNATIONS

A assembly	E miscellaneous electrical part	P electrical connector (movable portion); plug	U integrated circuit; microcircuit
AT attenuator; isolator; termination	F fuse	Q transistor: SCR; triode thyristor	V electron tube
B fan; motor	FL filter	R resistor	VR voltage regulator; breakdown diode
BT battery	H hardware	RT thermistor	W cable; transmission path; wire
C capacitor	HY circulator	S switch	X socket
CP coupler	J electrical connector (stationary portion); jack	T transformer	Y crystal unit (piezo-electric or quartz)
CR diode; diode thyristor; varactor	K relay	TB terminal board	Z tuned cavity; tuned circuit
DC directional coupler	L coil; inductor	TC thermocouple	
DL delay line	M meter	TP test point	
DS annunciator; signaling device (audible or visual); lamp; LED	MP miscellaneous mechanical part		

ABBREVIATIONS

A ampere	COEF coefficient	EDP electronic data processing	INT internal
ac alternating current	COM common	ELECT electrolytic	kg kilogram
ACCESS accessory	COMP composition	ENCAP encapsulated	kHz kilohertz
ADJ adjustment	COMPL complete	EXT external	k Ω kilohm
A/D analog-to-digital	CONN connector	F farad	kV kilovolt
AF audio frequency	CP cadmium plate	FET field-effect transistor	lb pound
AFC automatic frequency control	CRT cathode-ray tube	F/F flip-flop	LC inductance-capacitance
AGC automatic gain control	CTL complementary transistor logic	FH flat head	LED light-emitting diode
AL aluminum	CW continuous wave	FIL H fillister head	LF low frequency
ALC automatic level control	cw clockwise	FM frequency modulation	LG long
AM amplitude modulation	cm centimeter	FP front panel	LH left hand
AMPL amplifier	D/A digital-to-analog	FREQ frequency	LIM limit
APC automatic phase control	dB decibel	FXD fixed	LIN linear taper (used in parts list)
ASSY assembly	dBm decibel referred to 1 mW	g gram	lin linear
AUX auxiliary	dc direct current	GE germanium	LK WASH lock washer
avg average	deg degree (temperature interval or difference)	GHz gigahertz	LO low; local oscillator
AWG American wire gauge	° degree (plane angle)	GL glass	LOG logarithmic taper (used in parts list)
BAL balance	°C degree Celsius (centigrade)	GRD ground(ed)	log logarithm(ic)
BCD binary coded decimal	°F degree Fahrenheit	H henry	LPF low pass filter
BD board	°K degree Kelvin	h hour	LV low voltage
BE CU beryllium copper	DEPC deposited carbon	HET heterodyne	m meter (distance)
BFO beat frequency oscillator	DET detector	HEX hexagonal	mA milliamperes
BH binder head	diam diameter	HD head	MAX maximum
BKDN breakdown	DIA diameter (used in parts list)	HDW hardware	M Ω megohm
BP bandpass	DIFF AMPL differential amplifier	HF high frequency	MEG meg (10 ⁶) (used in parts list)
BPF bandpass filter	div division	HP Hewlett-Packard	MET FLM metal film
BRS brass	DPDT double-pole, double-throw	HPF high pass filter	MET OX metallic oxide
BWO backward-wave oscillator	DR drive	HR hour (used in parts list)	MF medium frequency; microfarad (used in parts list)
CAL calibrate	DSB double sideband	HV high voltage	MFR manufacturer
ccw counter-clockwise	DTL diode transistor logic	Hz Hertz	mg milligram
CER ceramic	DVM digital voltmeter	IC integrated circuit	MHz megahertz
CHAN channel	ECL emitter coupled logic	ID inside diameter	mH millihenry
cm centimeter	EMF electromotive force	IF intermediate frequency	mho mho
CMO cabinet mount only		IMPG impregnated	MIN minimum
COAX coaxial		in inch	min minute (time)
		INCD incandescent	... ' minute (plane angle)
		INCL include(s)	MINAT miniature
		INP input	mm millimeter
		INS insulation	

NOTE

All abbreviations in the parts list will be in upper-case.

Table 6-1. Reference Designations and Abbreviations (2 of 2)

MOD modulator	OD outside diameter	PWV peak working voltage	TD time delay
MOM momentary	OH oval head	RC resistance-capacitance	TERM terminal
MOS metal-oxide semiconductor	OP AMPL operational amplifier	RECT rectifier	TFT thin-film transistor
ms millisecond	OPT option	REF reference	TGL toggle
MTG mounting	OSC oscillator	REG regulated	THD thread
MTR meter (indicating device)	OX oxide	REPL replaceable	THRU through
mV millivolt	oz ounce	RF radio frequency	TI titanium
mVac millivolt, ac	Ω ohm	RFI radio frequency interference	TOL tolerance
mVdc millivolt, dc	P peak (used in parts list)	RH round head; right hand	TRIM trimmer
mVpk millivolt, peak	PAM pulse-amplitude modulation	RLC resistance-inductance-capacitance	TSTR transistor
mVp-p millivolt, peak-to-peak	PC printed circuit	RMO rack mount only	TTL transistor-transistor logic
mVrms millivolt, rms	PCM pulse-code modulation; pulse-count modulation	rms root-mean-square	TV television
mW milliwatt	PDM pulse-duration modulation	RND round	TVI television interference
MUX multiplex	pF picofarad	ROM read-only memory	TWT traveling wave tube
MY mylar	PH BRZ phosphor bronze	R&P rack and panel	U micro (10^{-6}) (used in parts list)
μ A microampere	PHL Phillips	RWV reverse working voltage	UF microfarad (used in parts list)
μ F microfarad	PIN positive-intrinsic-negative	S scattering parameter	UHF ultrahigh frequency
μ H microhenry	PIV peak inverse voltage	s second (time)	UNREG unregulated
μ ho micromho	pk peak	" second (plane angle)	V volt
μ s microsecond	PL phase lock	S-B slow-blow (fuse) (used in parts list)	VA voltampere
μ V microvolt	PLO phase lock oscillator	SCR silicon controlled rectifier; screw	Vac volts, ac
μ Vac microvolt, ac	PM phase modulation	SE selenium	VAR variable
μ Vdc microvolt, dc	PNP positive-negative-positive	SECT sections	VCO voltage-controlled oscillator
μ Vpk microvolt, peak	P/O part of	SEMICON semiconductor	Vdc volts, dc
μ Vp-p microvolt, peak-to-peak	POLY polystyrene	SHF superhigh frequency	VDCW volts, dc, working (used in parts list)
μ Vrms microvolt, rms	PORC porcelain	SI silicon	V(F) volts, filtered
μ W microwatt	POS positive; position(s) (used in parts list)	SIL silver	VFO variable-frequency oscillator
nA nanoampere	POSN position	SL slide	VHF very-high frequency
NC no connection	POT potentiometer	SNR signal-to-noise ratio	Vpk volts, peak
N/C normally closed	p-p peak-to-peak	SPDT single-pole, double-throw	Vp-p volts, peak-to-peak
NE neon	PP peak-to-peak (used in parts list)	SPG spring	Vrms volts, rms
NEG negative	PPM pulse-position modulation	SR split ring	VSWR voltage standing wave ratio
nF nanofarad	PREAMPL preamplifier	SPST single-pole, single-throw	VTO voltage-tuned oscillator
NI PL nickel plate	PRF pulse-repetition frequency	SSB single sideband	VTVM vacuum-tube voltmeter
N/O normally open	PRR pulse repetition rate	SST stainless steel	V(X) volts, switched
NOM nominal	ps picosecond	STL steel	W watt
NORM normal	PT point	SQ square	W/ with
NPN negative-positive-negative	PTM pulse-time modulation	SWR standing-wave ratio	WIV working inverse voltage
NPO negative-positive zero (zero temperature coefficient)	PWM pulse-width modulation	SYNC synchronize	WW wirewound
NRFR not recommended for field replacement		T timed (slow-blow fuse)	W/O without
NSR not separately replaceable		TA tantalum	YIG yttrium-iron-garnet
ns nanosecond		TC temperature compensating	Z _o characteristic impedance
nW nanowatt			
OBD order by description			

NOTE

All abbreviations in the parts list will be in upper-case.

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^9
M	mega	10^6
k	kilo	10^3
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	08900-60218	9	1	INTERCONNECT "C" BOARD ASSEMBLY	28480	08900-60218
A1J1	1251-0600	0	35	CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J2	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J3	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J4	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J5	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J6	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J7	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1J8	1251-0600	0		CONNECTOR-SGL CONT PIN 1 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1MP1				SWITCH GUIDE (NSR P/O A1)		
A1MP2				SWITCH GUIDE (NSR P/O A1)		
A1R1	0698-3434	9	1	RESISTOR 34.8 1% .125W F TC=0+-100	24546	C4 1/8-T0 3488 F
A1R2	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03868	PME55-1/8-T0-23R7-F
A1R3	2100-2010	2	1	RESISTOR-TRMR 10 20% C TOP-ADJ 1-TRN	73138	B2PR10
A1S1	08900-60232	7	1	SLIDE SWITCH ASSEMBLY	28480	08900-60232
A1S2	5020-3440	7	2	SPRING-DETENT	28480	5020-3440
	08900-60233	8	1	SLIDE SWITCH ASSEMBLY	28480	08900-60233
	5020-3440	7		SPRING-DETENT	28480	5020-3440
A1XA3	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A2	08900-60216	7	1	SHAPING BOARD ASSEMBLY	28480	08900-60216
A2C1	0160-3879	7	10	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C2	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C3	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C4	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C5	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C6	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C7	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C8	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C9	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C10	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A2C11	0160-4387	4	1	CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-5	28480	0160-4387
A2CR1	1901-0050	3	30	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR6	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR7	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR8	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR9	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR10	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR11	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR12	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR14	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR15	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR16	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR17	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR18	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR19	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR24	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR25	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR26	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR27	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR28	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR29	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2CR32	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2K1	0490-1013	6	2	RELAY REED 1C 250MA 28VDC 5VDC-COIL 3VA	28480	0490-1013
A2K2	0490-1013	6		RELAY-REED 1C 250MA 28VDC 5VDC COIL 3VA	28480	0490-1013
A2Q1	1854-0810	2	2	TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A2Q2	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A2R1	0698-4157	5	31	RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R2	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R3	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R4	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R5	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2R6	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R7	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R8	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R9	0699-0272	9	2	RESISTOR 75K .1% .125W F TC=0+-25	28480	0699-0272
A2R10	0698-8642	1	2	RESISTOR 56.2K .1% .125W F TC=0+-25	28480	0698-8642
A2R11	0698-3934	4	2	RESISTOR 42.18K .1% .125W F TC=0+-25	28480	0698-3934
A2R12	0698-8851	4	1	RESISTOR 34.7K .1% .125W F TC=0+-25	28480	0698-8851
A2R13	0698-7375	5	1	RESISTOR 28.64K .1% .125W F TC=0+-50	19701	MF4C1/8-T2-28641-B
A2R14	0698-7670	3	2	RESISTOR 23.69K .1% .125W F TC=0+-50	19701	MF4C1/8-T2-23691-B
A2R15	0698-8168	6	1	RESISTOR 20.51K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-20511-B
A2R16	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A2R17	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R18	0698-3449	6	3	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A2R19	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R20	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R21	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R22	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R23	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R24	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R25	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R26	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R27	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A2R28	0698-7933	1	4	RESISTOR 3.83K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-3831-B
A2R29	0699-0842	9	4	RESISTOR 6.19K .1% .125W F TC=0+-25	28480	0699-0842
A2R30	0699-0842	9		RESISTOR 6.19K .1% .125W F TC=0+-25	28480	0699-0842
A2R31	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A2R32	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A2R33	0698-7933	1		RESISTOR 3.83K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-3831-B
A2R34	0699-0843	0	2	RESISTOR 2.87K .1% .125W F TC=0+-25	28480	0699-0843
A2R35	2100-2497	9	1	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A2R36	0699-0902	2	1	RESISTOR 3.48K .1% .125W F TC=0+-50	28480	0699-0902
A2R37	0698-7232	3	1	RESISTOR 681 1% .05W F TC=0+-100	24546	C3-1/8-T0-681R-F
A2R38	0757-0417	8	2	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A2R39	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A2R40	0699-0842	9		RESISTOR 6.19K .1% .125W F TC=0+-25	28480	0699-0842
A2R41	0698-7933	1		RESISTOR 3.83K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-3831-B
A2R42	0698-3132	4	3	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A2R43	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A2R44	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R45	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R46	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R47	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R48	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R49	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R50	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R51				NOT ASSIGNED		
A2R52	0699-0575	5	1	RESISTOR 133K .1% .1W F TC=0+-15	28480	0699-0575
A2R53	0699-0272	9		RESISTOR 75K .1% .125W F TC=0+-25	28480	0699-0272
A2R54	0698-8642	1		RESISTOR 56.2K .1% .125W F TC=0+-25	28480	0698-8642
A2R55	0698-3934	4		RESISTOR 42.18K .1% .125W F TC=0+-25	28480	0698-3934
A2R56	0698-6991	9	1	RESISTOR 31.6K .1% .125W F TC=0+-50	28480	0698-6991
A2R57	0698-7670	3		RESISTOR 23.69K .1% .125W F TC=0+-50	19701	MF4C1/8-T2-23691-B
A2R58	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R59	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R60	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R61	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R62	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R63	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R64	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A2R65	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A2R66	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A2R67	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2R68	0698-6616	5	1	RESISTOR 750 1% .125W F TC=0+-25	28480	0698-6616
A2R69	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A2R70	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A2R71	0698-3439	4	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A2R72	0699-0843	0		RESISTOR 2.87K .1% .125W F TC=0+-25	28480	0699-0843
A2R73	0699-0842	9		RESISTOR 6.19K .1% .125W F TC=0+-25	28480	0699-0842
A2R74	0698-8061	8	2	RESISTOR 8.25K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-8251-B
A2R75	0698-8061	8		RESISTOR 8.25K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-8251-B
A2R76	0698-8657	8	1	RESISTOR 6.81K .1% .125W F TC=0+-50	28480	0698-8657
A2R77	0699-0533	5	1	RESISTOR 4.64K .1% .125W F TC=0+-25	28480	0699-0533
A2R78	0698-7933	1		RESISTOR 3.83K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-3831-B
A2R79	0698-3445	2	1	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A2R80	0698-3157	3	5	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2R81	2100-2030	6	1	RESISTOR-TRMR 20K 10% C TOP-ADJ 1-TRN	73138	82PR20K
A2R82	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2R83	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A2R84	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2R85	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2R86	2100-1738	9	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	73138	82PR10K
A2R87	0698-7639	6	1	RESISTOR 383 1% .125W F TC=0+-25	19701	MF4C1/8-T9-383R-B
A2R88	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2R89	0698-8818	3	1	RESISTOR 3.16 1% .125W F TC=0+-100	28480	0698-8818
A2TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2U1	1826-0323	3	4	IC OP AMP GP QUAD 14-DIP-C PKG	28480	1826-0323
A2U2	1826-0323	3		IC OP AMP GP QUAD 14-DIP-C PKG	28480	1826-0323
A2U3	1826-0323	3		IC OP AMP GP QUAD 14-DIP-C PKG	28480	1826-0323
A2U4	1826-0323	3		IC OP AMP GP QUAD 14-DIP-C PKG	28480	1826-0323
A2U5	1826-0013	8	1	IC OP AMP LOW-NOISE TO-99 PKG	06665	SS5741CJ
A2VR1	1902-0948	0	2	DIODE-ZNR 3.9V 5% DO-35 PD=.4W TC=-.012%	28480	1902-0948
A2VR2	1902-0948	0		DIODE-ZNR 3.9V 5% DO-35 PD=.4W TC=-.012%	28480	1902-0948
A3	08900-60214	5	1	MOTHERBOARD ASSEMBLY	28400	08900-60214
A3C1	0160-0040	9	1	CAPACITOR-FXD .047UF +-10% 200VDC POLYE	56289	292P47392
A3C2	0160-2055	9	6	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C5	0180-2102	9	2	CAPACITOR-FXD 700UF+75-10% 25VDC AL	28480	0180-2102
A3C6	0180-2102	9		CAPACITOR-FXD 700UF+75-10% 25VDC AL	28480	0180-2102
A3C7	0180-2619	3	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	25088	D22GS1815K
A3C8	0160-3501	2	1	CAPACITOR-FXD 4UF +-10% 50VDC MET-POLYC	28480	0160-3501
A3C9	0160-0127	2	8	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C10	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C11	0160-4766	3	1	CAPACITOR-FXD 30PF +-5% 200VDC CER 0+-30	28480	0160-4766
A3C12	0180-0229	7	3	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A3C13	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A3C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C16	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C17	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C18	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C19	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C20	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A3C21	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C22	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3C23	0160-0166	9	1	CAPACITOR-FXD .068UF +-10% 200VDC POLYE	28480	0160-0166
A3C24	0180-2206	4	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A3C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C26	0160-2619	1	2	CAPACITOR-FXD 27PF +-10% 1KVDC CER	28480	0160-2619
A3C27	0160-2619	1		CAPACITOR-FXD 27PF +-10% 1KVDC CER	28480	0160-2619
A3C28	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3C29	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3C30	0160-0576	5	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A3C31	0160-4765	2	1	CAPACITOR-FXD 36PF +-5% 200VDC CER 0+-30	28480	0160-4765
A3C32	0160-2239	1	1	CAPACITOR-FXD 1.0PF +-1.25PF 500VDC CER	28480	0160-2239
A3C33	0121-0105	4	1	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A3CR1	1901-0179	7	6	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR2	1901-0327	7	4	DIODE-PWR RECT 200V 1A 60S	03508	A14B
A3CR3	1901-0327	7		DIODE-PWR RECT 200V 1A 60S	03508	A14B
A3CR4	1901-0327	7		DIODE-PWR RECT 200V 1A 60S	03508	A14B
A3CR5	1901-0327	7		DIODE-PWR RECT 200V 1A 60S	03508	A14B
A3CR6	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR7	1902-0950	4	2	DIODE-ZNR 4.7V 5% DO-35 PD=.4W TC=+.025%	28480	1902-0950
A3CR8	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR9	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR11	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR11	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR12	1902-0950	4		DIODE-ZNR 4.7V 5% DO-35 PD=.4W TC=+.025%	28480	1902-0950
A3CR13	1901-0033	2	1	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3J1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3J2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3J3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3J4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3J5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3J6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3J7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3J8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3MP1	2200-0141	8	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3MP2	2200-0141	8		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3MP3	2240-0009	3	2	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A3MP4	2260-0009	3		NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A3MP5	3050-0105	6	2	WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
A3MP6	3050-0105	6		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
A3Q1	1854-0811	3	1	TRANSISTOR NPN SI PD=625MW FT=100MHZ	28480	1854-0811
A3Q2	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A3Q3	1853-0405	9	1	TRANSISTOR PNP SI PD=300MW FT=850MHZ	04713	2N4209
A3Q4	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A3Q5	1854-0457	3	2	TRANSISTOR-DUAL NPN PD=400MW	28480	1854-0457
A3Q6	1854-0457	3		TRANSISTOR-DUAL NPN PD=400MW	28480	1854-0457
A3R1	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A3R2	0757-0401	0	9	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R3	2100-2413	9	2	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	30983	ET50X201
A3R4	0698-8820	7	1	RESISTOR 4.64 1% .125W F TC=0+-100	28480	0698-8820
A3R5	0757-0280	3	4	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R6	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3R7	2100-2517	4	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	30983	ET50X503
A3R8	2100-2489	9	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	30983	ET50X502
A3R9	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A3R10	0698-3159	5	1	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A3R11	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3R12	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3R13	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R14	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R15	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R16	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A3R17	0698-8827	4	1	RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A3R18	0698-8814	9	1	RESISTOR 1.47 1% .125W F TC=0+-100	28480	0698-8814
A3R19	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A3R20	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A3R21	2100-1985	8	1	RESISTOR-TRMR 20 20% C TOP-ADJ 1-TRN	32997	3329H-1-200
A3R22	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A3R23	2100-2060	2	1	RESISTOR-TRMR 50 20% C TOP-ADJ 1-TRN	73138	B2PR50
A3R24	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3R25	0757-0438	3	6	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3R26	2100-2633	5	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	30983	ET50X102
A3R27	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R28	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3R29	0757-0463	4	1	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A3R30	0698-3449	6		RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A3R31	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3R32	0698-3432	7	1	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A3R33	0698-3150	6	3	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3R34	0757-0461	2	1	RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A3R35	0698-3449	6		RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A3R36	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3R37	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A3R38	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3R39	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3R40	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3R41	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R42	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R43	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R44	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R45	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A3R46	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R47	2100-2413	9		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	30983	ET50X201
A3R48	0757-0399	5	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A3R49	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A3R50	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A3R51	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3R52	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3R53	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3R54	2100-2489	9		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	30983	ET50X502
A3R55	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3R56	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3R57	0757-0422	5	1	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A3R58	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3R59	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3R60	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3R61	0757-0402	1	1	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/B-T0-111-F
A3R62	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/B-T0-101-F
A3R63	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/B-T0-101-F
A3RT1	0839-0011	2	1	THERMISTOR DISC 100-OHM TC=-3.8%/C-DEG	28480	0839-0011
A3TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP9	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP10	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP11	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP12	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3TP13	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3U1	1826-0026	3	1	IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A3U2	1826-0025	2	1	IC OP AMP LOW-DRIFT TO-99 PKG	27014	LM208AH
A3U3	1820-1971	7	1	IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DC201CJ
A3U4	1820-1282	3	1	IC FF TTL LS J-K BAR POS-EDGE-TRIG	01295	SN74LS109AN
A3U5	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	01295	NE555P
A3U6	1826-0217	4	1	IC OP AMP GP DUAL TO-99 PKG	07933	RC4558T
A3U7	1826-0215	2	1	IC V RGLTR TO-220	04713	HC7905.2CT
A3U8	1826-0122	0	1	IC 7805 V RGLTR TO-220	07263	7805UC
A3XA2	1251-0472	4	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4	0960-0443	1	1	MODULE ASSEMBLY-POWER LINE (ORDER C1 WITH A4)	28480	0960-0443
C1	0160-4851	7	1	CAPACITOR-FXD .022UF 20% 250VDC	28480	0160-4851

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
F1	2110-0234	9	1	FUSE .1A 250V TD 1.25X.25 UL (FOR 100 TO 120V AC INPUT)	71400	MDL 1/10,
F1	2110-0311	3	1	FUSE .062A 250V TD 1.25X.25 UL (FOR 200 TO 240V AC INPUT)	75915	313.062
J1	1251-1864	0	1	CONNECTOR-5 PIN FEMALE(SENDR INPUT)	28480	1251-1864
J2	1250-0083	1	3	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0083
J3	1250-0083	1		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0083
J4	1250-0083	1		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0083
M1	1120-0696	7	1	METER	28480	1120-0696

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP1	0360-0001	5	2	TERMINAL-SLDR LUG LK-MTG FOR-#6-SCR	28480	0360-0001
MP2	0360-0001	5		TERMINAL-SLDR LUG LK-MTG FOR-#6-SCR	28480	0360-0001
MP3	0360-0353	0	4	BRACKET-RTANG .406-LG X .343-LG .312-WD	28480	0360-0353
MP4	0360-0353	0		BRACKET-RTANG .406-LG X .343-LG .312-WD	28480	0360-0353
MP5	0360-0353	0		BRACKET-RTANG .406-LG X .343-LG .312-WD	28480	0360-0353
MP6	0360-0353	0		BRACKET-RTANG .406-LG X .343-LG .312-WD	28480	0360-0353
MP7	0362-0227	1	9	CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP8	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP9	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP10	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP11	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP12	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP13	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP14	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP15	0362-0227	1		CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ	28480	0362-0227
MP16	0370-1091	6	1	KNOB-BASE 1/2 JGK .25-IN-ID	28480	0370-1091
MP17	0590-0039	6	4	NUT-SHMET 6-32-THD .28-WD STL	28480	0590-0039
MP18	0590-0039	6		NUT-SHMET 6-32-THD .28-WD STL	28480	0590-0039
MP19	0590-0039	6		NUT-SHMET 6-32-THD .28-WD STL	28480	0590-0039
MP20	0590-0039	6		NUT-SHMET 6-32-THD .28-WD STL	28480	0590-0039
MP21	0590-0052	3	2	NUT-SHMET-J-TP 6-32-THD .5-WD STL	28480	0590-0052
MP22	0590-0052	3		NUT-SHMET-J-TP 6-32-THD .5-WD STL	28480	0590-0052
MP23	1490-0031	7	1	TILT STAND 2.236-IN-W 4.438-IN-DA-I.G SST	28480	1490-0031
MP24				NOT ASSIGNED		
MP25	2190-0003	8	2	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
MP26	2190-0003	8		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
MP27	2190-0016	3	5	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
MP28	2190-0016	3		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
MP29	2190-0016	3		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
MP30	2190-0016	3		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
MP31	2190-0016	3		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
MP32	2190-0017	4	2	WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP33	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP34	2190-0047	0	4	WASHER-LK 82 CTSK EXT T NO. 6 .142-IN-ID	28480	2190-0047
MP35	2190-0047	0		WASHER-LK 82 CTSK EXT T NO. 6 .142-IN-ID	28480	2190-0047
MP36	2190-0047	0		WASHER-LK 82 CTSK EXT T NO. 6 .142-IN-ID	28480	2190-0047
MP37	2190-0047	0		WASHER-LK 82 CTSK EXT T NO. 6 .142-IN-ID	28480	2190-0047
MP38	2260-0002	6	2	NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	00000	ORDER BY DESCRIPTION
MP39	2260-0002	6		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	00000	ORDER BY DESCRIPTION
MP40	2360-0116	5	13	SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP41	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP42	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP43	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP44	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP45	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP46	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP47	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP48	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP49	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP50	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP51	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP52	2360-0116	5		SCREW-MACH 6-32 .312-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP53	2360-0117	6	4	SCREW-MACH 6-32 .375-IN-LG PAN-HD POZI	00000	ORDER BY DESCRIPTION
MP54	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD POZI	00000	ORDER BY DESCRIPTION
MP55	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD POZI	00000	ORDER BY DESCRIPTION
MP56	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD POZI	00000	ORDER BY DESCRIPTION
MP57	2360-0120	1	5	SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP58	2360-0120	1		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP59	2360-0120	1		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP60	2360-0120	1		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP61	2360-0120	1		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP62	2360-0180	3	4	SCREW-MACH 6-32 .188-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP63	2360-0180	3		SCREW-MACH 6-32 .188-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP64	2360-0180	3		SCREW-MACH 6-32 .188-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP65	2360-0180	3		SCREW-MACH 6-32 .188-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP66	2360-0192	7	8	SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP67	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP68	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP69	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP70	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP71	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP72	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP73	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP74	2360-0194	9	2	SCREW-MACH 6-32 .312-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP75	2360-0194	9		SCREW-MACH 6-32 .312-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP76	2420-0002	6	2	NUT-HEX-DBL-CHAM 6-32-THD .109-IN-THK	28480	2420-0002
MP77	2420-0002	6		NUT-HEX-DBL-CHAM 6-32-THD .109-IN-THK	28480	2420-0002
MP78	2510-0103	9	2	SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP79	2510-0103	9		SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP80	2500-0002	4	2	NUT-HEX-DBL-CHAM 8-32-THD .085-IN-THK	00000	ORDER BY DESCRIPTION
MP81	2500-0002	4		NUT-HEX-DBL-CHAM 8-32-THD .085-IN-THK	00000	ORDER BY DESCRIPTION
MP82	2950-0001	8	3	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP83	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP84	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP85	2950-0043	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP86	3030-0139	4	2	SCREW-SKT HD CAP 6-32 .375-IN-LG SST	00000	ORDER BY DESCRIPTION
MP87	3030-0139	4		SCREW-SKT HD CAP 6-32 .375-IN-LG SST	00000	ORDER BY DESCRIPTION
MP88	3050-0227	3	1	WASHER-FL MTLG NO. 6 .149-IN-ID	28480	3050-0227
MP89	7120-1254	1	1	NAMEPLATE .312-IN-WD .54-IN-LG AL	28480	7120-1254
MP90	7120-4163	7	1	LABEL-WARNING .5-IN-WD 1-IN-LG AL	28480	7120-4163
MP91	5000-8565	5	2	COVER-SIDE 6 X 11	28480	5000-8565
MP92	5000-8565	5		COVER-SIDE 6 X 11	28480	5000-8565
MP93	5000-8571	3	1	COVER-BOTTOM 5 X 11	28480	5000-8571
MP94	5020-0700	6	1	SPACER-CABINET	28480	5020-0700
MP95	5020-7633	8	1	METER TRIM-3RD MODULE	28480	5020-7633
MP96	5040-0700	8	2	HINGE	28480	5040-0700
MP97	5040-0700	8		HINGE	28480	5040-0700
MP98				NOT ASSIGNED		
MP99	5060-0703	3	2	FRAME ASSEMBLY- 6 X 11 SM	28480	5060-0703
MP100	5060-0703	3		FRAME ASSEMBLY- 6 X 11 SM	28480	5060-0703
MP101	5060-0727	1	2	FOOT ASSEMBLY-3RD MODULE	28480	5060-0727
MP102	5060-0727	1		FOOT ASSEMBLY-3RD MODULE	28480	5060-0727
MP103	5060-8555	9	1	COVER ASSEMBLY-(TOP) 5 X 11	28480	5060-8555
MP104	08900-00208	1	1	PANEL (FRONT)	28480	08900-00208
MP105	08900-00210	5	1	PANEL (SUB)	28480	08900-00210
MP106	08900-00212	7	1	PANEL (REAR)	28480	08900-00212
MP107	1400-0017	0	1	CLAMP-CABLE .312-DIA .375-WD NYL	28480	1400-0017
MP108	1400-0249	0	1	CABLE TIE .062-.625-DIA .091-WD NYL	06383	PLTIM-8
MP109	7120-8968	8	1	TAG-INFORMATION	28480	7120-8968
MP110	1400-0249	0		STRAP-CABLE	28480	1400-0249
R1	2100-2746	1	1	RESISTOR-VAR PREC WW 5-TRN 200 3% (COMPARE LEVEL)	28480	2100-2746
R2				NOT ASSIGNED		
R3	2100-3843	1	1	DIGITAL DISPLAY 100 OHMS +-1%; 2W; 2 (CORRECTION)	28480	2100-3843
T1	9100-0460	9	1	TRANSFORMER-POWER 100/120/220/240V	28480	9100-0460
W1	8120-1378	1	1	CABLE ASSY 18AWG 3-CNDCT JCK-JKT (LINE)	28480	8120-1378
W2	08900-60220	3	1	CABLE ASSEMBLY-LINE SWITCH	28480	08900-60220
W2D51	3131-0434	6	1	LENS ASSY-PUSHBUTTON,WHITE TRANSLUCENT	28480	3131-0434

See introduction to this section for ordering information

Table 6-3. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address	Zip Code
00000	ANY SATISFACTORY SUPPLIER		
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75222
03508	GE CO SEMICONDUCTOR PROD DEPT	AUBURN NY	13201
03888	K D I PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
06383	PANDUIT CORP	TINLEY PARK IL	60477
06665	PRECISION MONOLITHICS INC	SANTA CLARA CA	95050
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94042
07933	RAYTHEON CO SEMICONDUCTOR DIV HQ	MOUNTAIN VIEW CA	94040
17856	SILICONIX INC	SANTA CLARA CA	95054
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
25088	SIEMENS CORP	ISELIN NJ	08830
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
52763	STETTNER-TRUSH INC	CAZENOVIA NY	13035
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63107
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
75915	LITTELFUSE INC	DES PLAINES IL	60016

SECTION VII MANUAL CHANGES

7-1. INTRODUCTION

This section normally contains information for adapting this manual to instruments for which the content does not apply directly. Since this manual does apply directly to instruments having serial

numbers listed on the title page, no change information is given here. Refer to INSTRUMENTS COVERED BY MANUAL in Section I for additional important information about serial number coverage.

SECTION VIII SERVICE

WARNINGS

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection). In addition, verify that a common ground exists between the unit under test and this instrument prior to energizing either unit.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction), make sure the common terminal is connected to neutral (that is, the grounded side of the mains supply).

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay, etc.). Do not use repaired fuses or short circuited fuseholders.

8-1. INTRODUCTION

This section contains instructions for troubleshooting and repairing the Peak Power Meter. It includes principles of operation, troubleshooting informa-

tion, component location photographs, schematics, an illustrated parts breakdown, instrument internal views, and disassembly procedures. The rest of the section has general service information that should help you service and repair the instrument.

8-2. PRINCIPLES OF OPERATION

Principles of operation appear on the foldout pages opposite the block diagram and schematics. Figure 8-3 is a block diagram that briefly describes overall instrument operation. It is keyed, by the numbers in the lower, right-hand corners of the blocks, to the schematics on the service sheets that follow. These service sheets provide a stage-by-stage description of the circuits on the schematics. The descriptions are keyed to stage names that appear in brackets on the schematics.

NOTE

Figure 8-1 Schematic Diagram Notes, explains most symbols that appear on the schematics.

8-3. TROUBLESHOOTING

8-4. Overall Troubleshooting

The overall block diagram (Figure 8-3) has a set of test conditions to help isolate a problem to a particular service sheet. If the trouble cannot be located using the block diagram, the troubleshooting text should be used to find the problem.

8-5. Circuit-Level Troubleshooting

After a problem has been isolated to an assembly (and corresponding service sheet), the text and table on the service sheet present detailed troubleshooting information for the circuit.

8-6. RECOMMENDED TEST EQUIPMENT

Descriptions and critical specifications for equipment are located in the table of Recommended Test Equipment in Section I. Substitute equipment can be used if it meets the minimum critical specifications.

8-7. SERVICE AIDS**8-8. Posidriv Screwdrivers.**

Many screws in the instrument appear to be Phillips, but are not. To avoid damage to the screw slots, Posidriv screwdrivers should be used.

8-9. Servicing Aids on Printed Circuit Boards.

The servicing aids include test points, transistor and integrated circuit designations, adjustment callouts and assembly stock numbers.

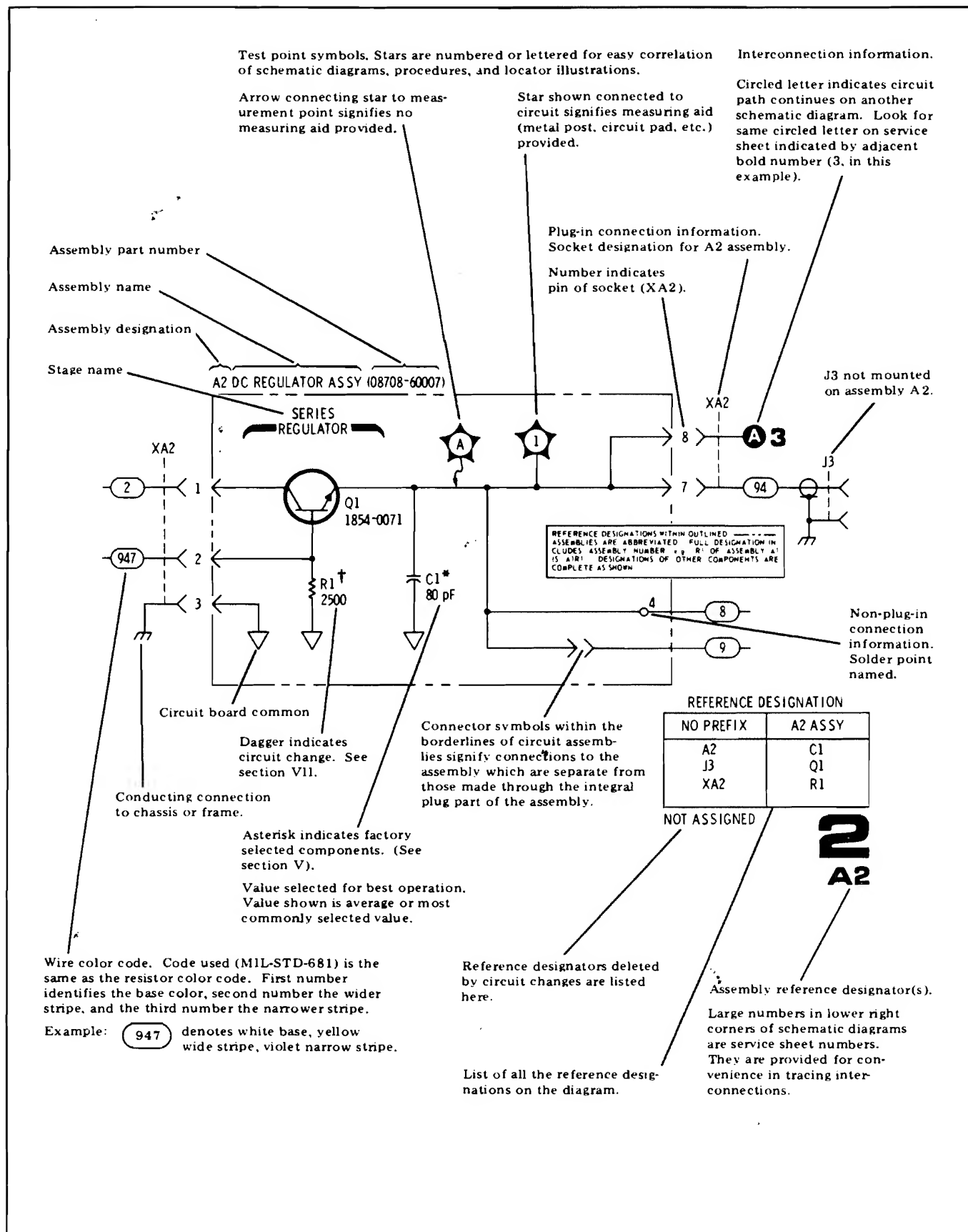


Figure 8-1. Schematic Diagram Notes (1 of 8)

SCHEMATIC DIAGRAM NOTES




















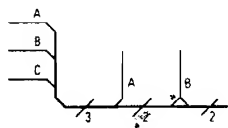
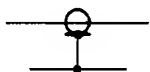
*	Asterisk denotes a factory-selected value. Value shown is typical. See Section V.		
†	Dagger indicates circuit change. See Section VII.		
	Tool-aided adjustment.		Manual control.
	Encloses front-panel designation.		
	Encloses rear-panel designation.		
	Circuit assembly borderline.		
	Other assembly borderline.		
	Heavy line with arrows indicates path and direction of main signal.		
	Heavy dashed line with arrows indicates path and direction of main feedback.		
	Indicates stripline (i.e., RF transmission line above ground).		
	Wiper moves toward cw with clockwise rotation of control (as viewed from shaft or knob).		
	Numbered Test Point measurement aid provided.		
	Encloses wire or cable color code. Code used is the same as the resistor color code. First number identifies the base color, second number identifies the wider stripe, and the third number identifies the narrower stripe, e.g.,  denotes white base, yellow wide stripe, violet narrow stripe.		
	A direct conducting connection to earth, or a conducting connection to a structure that has a similar function (e.g., the frame of an air, sea, or land vehicle).		
	A conducting connection to a chassis or frame.		
	Common connections. All like-designation points are connected.		
	Letter = off-page connection, e.g.,  . Number = Service Sheet number for off-page connection, e.g., 12 .		
	Number (only) = on-page connection.		

Figure 8-1. Schematic Diagram Notes (2 of 8)

SCHEMATIC DIAGRAM NOTES



Indicates multiple paths represented by only one line. Letters or names identify individual paths. Numbers indicate number of paths represented by the line.



Coaxial or shielded cable.



Relay. Contact moves in direction of arrow when energized.



Indicates a pushbutton switch with a momentary (ON) position.



Indicates a PIN diode.



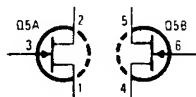
Indicates a current regulation diode.



Indicates a voltage regulation diode.



Indicates a Schottky (hot-carrier) diode.



Multiple transistors in a single package—physical location of the pins is shown in package outline on schematic.

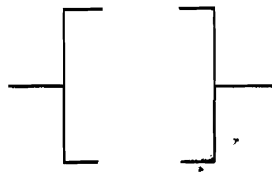


Identification of logic families as shown (in this case, ECL).

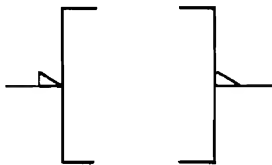
Figure 8-1. Schematic Diagram Notes (3 of 8)

DIGITAL SYMBOLOGY REFERENCE INFORMATION

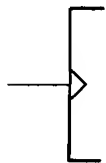
Input and Output Indicators



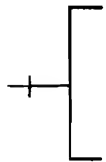
Implied Indicator—Absence of polarity indicator (see below) implies that the active state is a relative high voltage level. Absence of negation indicator (see below) implies that the active state is a relative high voltage level at the input or output.



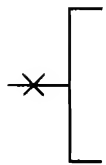
Polarity Indicator—The active state is a relatively low voltage level.



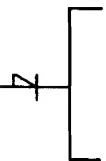
Dynamic Indicator—The active state is a transition from a relative low to a relative high voltage level.



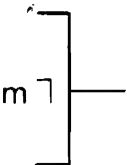
Inhibit Input—Input that, when active, inhibits (blocks) the active state outputs of a digital device.



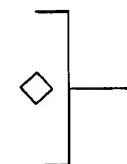
Analog Input—Input that is a continuous signal function (e.g., a sine wave).



Polarity Indicator used with Inhibit Indicator—Indicates that the relatively low level signal inhibits (blocks) the active state outputs of a digital device.



Output Delay—Binary output changes state only after the referenced input (m) returns to its inactive state (m should be replaced by appropriate dependency or function symbols).



Open Collector or Open Emitter Output.

Figure 8-1. Schematic Diagram Notes (4 of 8)

DIGITAL SYMBOLOGY REFERENCE INFORMATION

Input and Output Indicators (Cont'd)

3-STATE

Three-state Output—Indicates outputs that can have a high impedance (disconnect) state in addition to the normal binary logic states.

Combinational Logic Symbols and Functions

&

AND—All inputs must be active for the output to be active.

≥ 1

OR—One or more inputs being active will cause the output to be active.

$\geq m$

Logic Threshold— m or more inputs being active will cause the output to be active (replace m with a number).

$= 1$

EXCLUSIVE OR—Output will be active when one (and only one) input is active.

$= m$

m and only m —Output will be active when m (and only m) inputs are active (replace m with a number).

$=$

Logic Identity—Output will be active only when all or none of the inputs are active (i.e., when all inputs are identical, output will be active).



Amplifier—The output will be active only when the input is active (can be used with polarity or logic indicator at input or output to signify inversion).

X/Y

Signal Level Converter—Input level(s) are different than output level(s).



Bilateral Switch—Binary controlled switch which acts as an on/off switch to analog or binary signals flowing in both directions. Dependency notation should be used to indicate affecting/affected inputs and outputs. Note: amplifier symbol (with dependency notation) should be read to indicate unilateral switching.

X→Y

Coder—Input code (X) is converted to output code (Y) per weighted values or a table.

(Functional Labels)

The following labels are to be used as necessary to ensure rapid identification of device function.

MUX

Multiplexer—The output is dependent only on the selected input.

DEMUX

Demultiplexer—Only the selected output is a function of the input.



CPU

Central Processing Unit

Figure 8-1. Schematic Diagram Notes (5 of 8)

DIGITAL SYMBOLOGY REFERENCE INFORMATION

Sequential Logic Functions

1 	Monostable—Single shot multivibrator. Output becomes active when the input becomes active. Output remains active (even if the input becomes inactive) for a period of time that is characteristic of the device and/or circuit.
G 	Oscillator—The output is a uniform repetitive signal which alternates between the high and low state values. If an input is shown, then the output will be active if and only if the input is in the active state.
FF	Flip-Flop—Binary element with two stable states, set and reset. When the flip-flop is set, its outputs will be in their active states. When the flip-flop is reset, its outputs will be in their inactive states.
T	Toggle Input—When active, causes the flip-flop to change states.
S	Set Input—When active, causes the flip-flop to set.
R	Reset Input—When active, causes the flip-flop to reset.
J	J Input—Analogous to set input.
K	K Input—Analogous to reset input.
D	Data Input—Always enabled by another input (generally a C input—see Dependency Notation). When the D input is dependency-enabled, a high level at D will set the flip-flop; a low level will reset the flip-flop. Note: strictly speaking, D inputs have no active or inactive states—they are just enabled or disabled.
+m	Count-Up Input—When active, increments the contents (count) of a counter by "m" counts (m is replaced with a number).
-m	Count-Down Input—When active, decrements the contents (count) of a counter by "m" counts (m is replaced with a number).
→m	Shift Right (Down) Input—When active, causes the contents of a shift register to shift to the right or down "m" places (m is replaced with a number).
←m	Shift Left (Up) Input—When active, causes the contents of a shift register to shift to the left or up "m" places (m is replaced with a number).

NOTE

For the four functions shown above, if m is one, it is omitted.

(Functional Labels)	The following functional labels are to be used as necessary in symbol build-ups to ensure rapid identification of device function.
mCNTR	Counter—Array of flip-flops connected to form a counter with modules m (m is replaced with a number that indicates the number of states: 5 CNTR, 10 CNTR, etc.).

Figure 8-1. Schematic Diagram Notes (6 of 8)

DIGITAL SYMBOLOGY REFERENCE INFORMATION

Sequential Logic Functions (Cont'd)

REG	Register—Array of unconnected flip-flops that form a simple register or latch.
SREG	Shift Register—Array of flip-flops that form a register with internal connections that permit shifting the contents from flip-flop to flip-flop.
ROM	Read Only Memory—Addressable memory with read-out capability only.
RAM	Random Access Memory—Addressable memory with read-in and read-out capability.

Dependency Notation

mAm	Address Dependency—Binary affecting inputs of affected outputs. The m prefix is replaced with a number that differentiates between several address inputs, indicates dependency, or indicates demultiplexing and multiplexing of address inputs and outputs. The m suffix indicates the number of cells that can be addressed.
Gm	Gate (AND) Dependency—Binary affecting input with an AND relationship to those inputs or outputs labeled with the same identifier. The m is replaced with a number or letter (the identifier).
Cm	Control Dependency—Binary affecting input used where more than a simple AND relationship exists between the C input and the affected inputs and outputs (used only with D-type flip-flops).
Vm	OR Dependency—Binary affecting input with an OR relationship to those inputs or outputs labeled with the same identifier. The m is replaced with a number or the letter (the identifier).
Fm	Free Dependency—Binary affecting input acting as a connect switch when active and a disconnect when inactive. Used to control the 3-state behavior of a 3-state device.

NOTE

The identifier (m) is omitted if it is one—that is, when there is only one dependency relationship of that kind in a particular device. When this is done, the dependency indicator itself (G, C, F, or V) is used to prefix or suffix the affected (dependent) input or output.

Miscellaneous



Schmitt Trigger—Input characterized by hysteresis; one threshold for positive going signals and a second threshold for negative going signals.

Figure 8-1. Schematic Diagram Notes (7 of 8)

DIGITAL SYMBOLOGY REFERENCE INFORMATION**Miscellaneous (Cont'd)**

Active	Active State—A binary physical or logical state that corresponds to the true state of an input, an output, or a function. The opposite of the inactive state.
Enable	<p>Enabled Condition—A logical state that occurs when dependency conditions are satisfied. Although not explicitly stated in the definitions listed above, functions are assumed to be enabled when their behavior is described. A convenient way to think of it is as follows:</p> <p>A function becomes active when:</p> <ul style="list-style-type: none">• it is enabled (dependency conditions—if any—are satisfied)• and its external stimulus (e.g., voltage level) enters the active state.

Figure 8-1. Schematic Diagram Notes (8 of 8)

8-10. TROUBLESHOOTING

1. Turn the instrument on. Observe the on/off switch indicator lamp, and meter. The lamp should be on and the meter indicator needle should move. This check assures that ac power is available in the Peak Power Meter.

2. Set the MODE switch to COMPARE, and adjust the COMPARE LEVEL control. The meter should change value as the COMPARE LEVEL control is moved. This step applies a signal to the 8X Inverter Amplifier, Shaper and meter circuits (**Service Sheet 1 and 2**).

3. Remove the side covers. Check the +5.2V ± 0.025 V and -5.4V ± 0.025 V power supplies for proper voltage. The power supply testpoints are on the A3 assembly (A3TP18 and A3TP12).

4. Set the MODE switch to DIRECT. Set the RANGE switch to 10 mW. Using a dc power supply, apply -0.16 volts to the terminal with the green wire on the CORRECTION control, behind the front panel. The meter should display full scale deflection, indicating proper operation of the Negative Peak Detector, the 8X Inverter Amplifier, the Shaper board and the meter circuit (**Service Sheets 1, 2 and 3**).

5. Remove the plastic shell from the peak power sensor, then the magnetic shields and finally the top half of the sensor body. Apply -1.27 volts from a dc power supply to the spring contact on the sensor amplifier. Set the RANGE switch on the Peak Power Meter to 100 mW. Connect the peak power sensor to the Peak Power Meter. The meter should indicate 100 mW. This check will verify proper operation of the Sensor Amplifier, and sensor cabling to the Peak Power Meter. (**Refer to the Peak Power Sensor manual for the sensor schematic.**)

6. Apply a known pulsed microwave signal of 1 to 100 mW to the peak power sensor. Check for proper power level indication on the meter. Connect an oscilloscope to the TRIGGER OUTPUT, then to the VIDEO OUTPUT on the Peak Power Meter. These checks will assure that the Trigger Amplifier and Video Amplifier are operational as well as checking the detector diode in the peak power sensor (**Service Sheet 1 and sensor schematic**).

7. If a problem appears to be on the shaper board, it may be checked out by adjusting the COMPARE

LEVEL control and measuring the voltage level on the input testpoint, A2TP1, while monitoring the Peak Power Meter display. Table 8-1 and 8-2 shows the value of input voltage versus meter display.

Table 8-1. Meter Reading and Input Voltage

10 mW Shaper	
Input Voltage (A2TP1)	Peak Power Meter Reading
0.121 Vdc	0.6 \pm 0.15 mW
0.156 Vdc	0.8 \pm 0.10 mW
0.246 Vdc	1.4 \pm 0.10 mW
0.316 Vdc	2.0 \pm 0.10 mW
0.412 Vdc	3.0 \pm 0.15 mW
0.570 Vdc	5.0 \pm 0.25 mW
0.729 Vdc	7.5 \pm 0.38 mW
0.865 Vdc	10.0 \pm 0.50 mW

Table 8-2. Meter Reading and Input Voltage

100 mW Shaper	
Input Voltage (A2TP1)	Peak Power Meter Reading
0.640 Vdc	6.0 \pm 1.00 mW
0.865 Vdc	10.0 \pm 0.50 mW
1.136 Vdc	16.0 \pm 0.80 mW
1.459 Vdc	25.0 \pm 1.25 mW
1.755 Vdc	35.0 \pm 1.75 mW
2.125 Vdc	50.0 \pm 2.50 mW
2.611 Vdc	75.0 \pm 3.75 mW
3.000 Vdc	100.0 \pm 5.00 mW

8. Since the Shaper board is divided into two sections, it must be checked for proper operation in both the 10 mW and 100 mW modes. The main difference between the 10 mW and 100 mW shapers is that there is a preamplifier with a gain control in the 10 mW input circuit. Each of the shaper amplifiers operates at a slightly higher input voltage than the previous amplifier. Since the outputs of the shaper amplifiers are summed prior to the signal being sent to the meter circuit, they

TROUBLESHOOTING (cont'd)

should be checked at their output prior to the summing junction to find the shaper section that is faulty. As the input voltage is increased above the input bias voltage, the amplifier will turn on, resulting in an increased output voltage. To check the 10 mW Shaper, apply an input using the COMPARE LEVEL control, and monitor the voltage at the 3.3X OUT testpoint, A2TP2. Set the voltage at the testpoint (A2TP2) to 3.000 ± 0.002 Vdc. The output voltages should be as shown on Table 8-3. Measure the voltage at the junction of the output diode, feedback and summing resistors for each shaper amplifier. (See Figure 8-2.) The 100 mW Shaper is checked in the same manner as the 10 mW Shaper, except that the input voltage is measured at the INPUT testpoint (A2TP1). See Table 8-4 for proper output voltages.

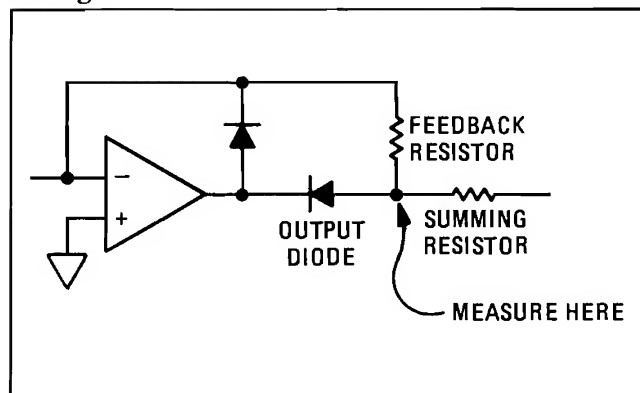


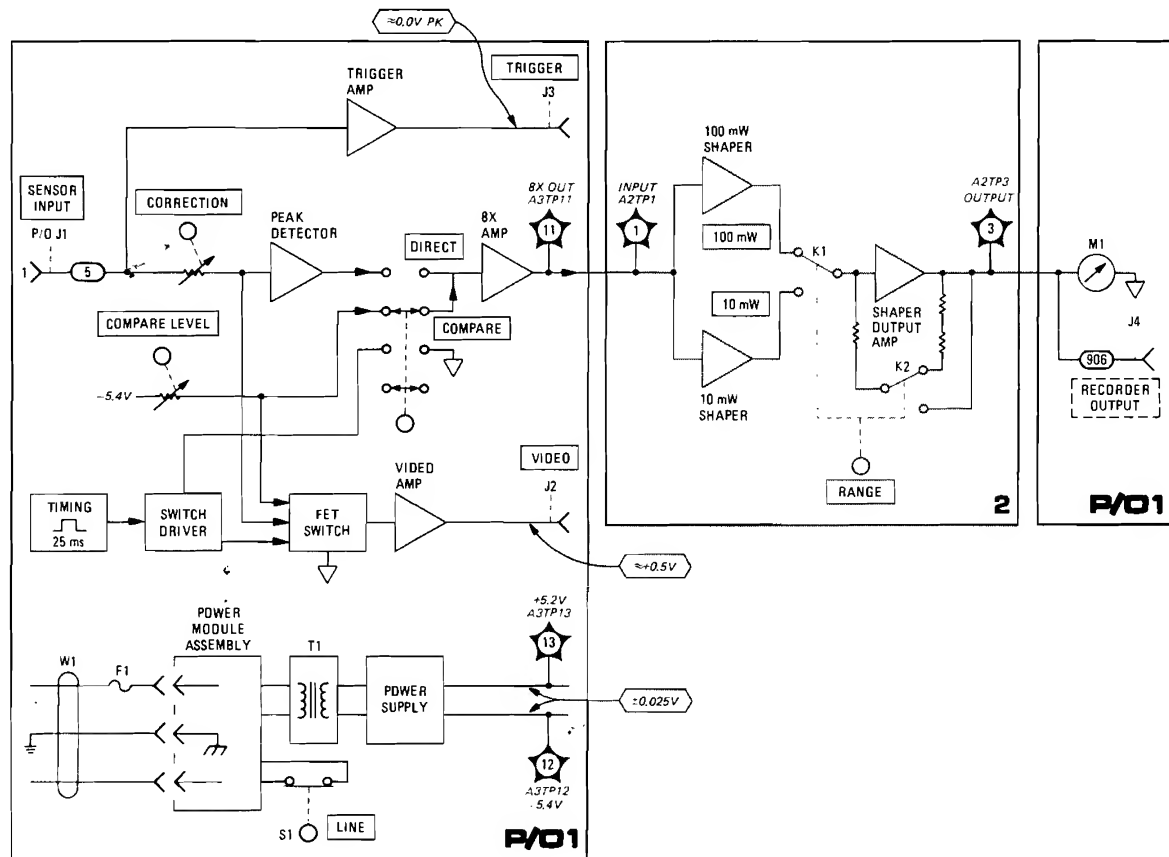
Figure 8-2. P/O Shaper Amplifier

Table 8-3. Shaper Amplifier Output Voltages

10 mW Shaper with 3.000 Vdc output from 10 mW GAIN Amplifier.		
IC	OUTPUT VOLTAGE (nom.)	VOLTAGE LIMITS
U3B	-3.000 Vdc	-2.965 to -3.035 Vdc
U3C	-2.594 Vdc	-2.563 to -2.625 Vdc
U3D	-2.280 Vdc	-2.252 to -2.308 Vdc
U4A	-2.039 Vdc	-2.014 to -2.065 Vdc
U4B	-1.720 Vdc	-1.698 to -1.742 Vdc
U4C	-1.291 Vdc	-1.273 to -1.309 Vdc
U4D	-0.720 Vdc	-0.708 to -0.733 Vdc

Table 8-4. Shaper Amplifier Output Voltages

100 mW Shaper with 3.000 Vdc input.		
IC	OUTPUT VOLTAGE (nom.)	VOLTAGE LIMITS
U1A	-3.000 Vdc	-2.965 to -3.035 Vdc
U1B	-2.280 Vdc	-2.252 to -2.308 Vdc
U1C	-2.039 Vdc	-2.014 to -2.065 Vdc
U1D	-1.720 Vdc	-1.698 to -1.742 Vdc
U2A	-1.448 Vdc	-1.429 to -1.468 Vdc
U2B	-1.115 Vdc	-1.099 to -1.131 Vdc
U2C	-0.720 Vdc	-0.708 to -0.733 Vdc
U2D	-0.367 Vdc	-0.358 to -0.376 Vdc



INITIAL CONDITIONS*

Set the front panel controls to:

Correction: 50

Reading Offset: 0 dB

Range: 100 mW

Mode: Direct

Input¹: 100 mW CW to the peak power sensor. (Or use a power supply to apply precisely -0.5562 volts at the SENSOR INPUT J1 pin 1.)

Verify the voltages are as shown in Table 8-5.

Change the front panel controls to:

Correction: 50

Reading Offset: 0 dB

Range: 10 mW

Mode: Direct

Input¹: 10 mW CW to the peak power sensor. (Or use a power supply to apply precisely -0.1605 volts at the SENSOR INPUT, J1 pin 1.)

Verify the voltages are as shown in Table 8-5.

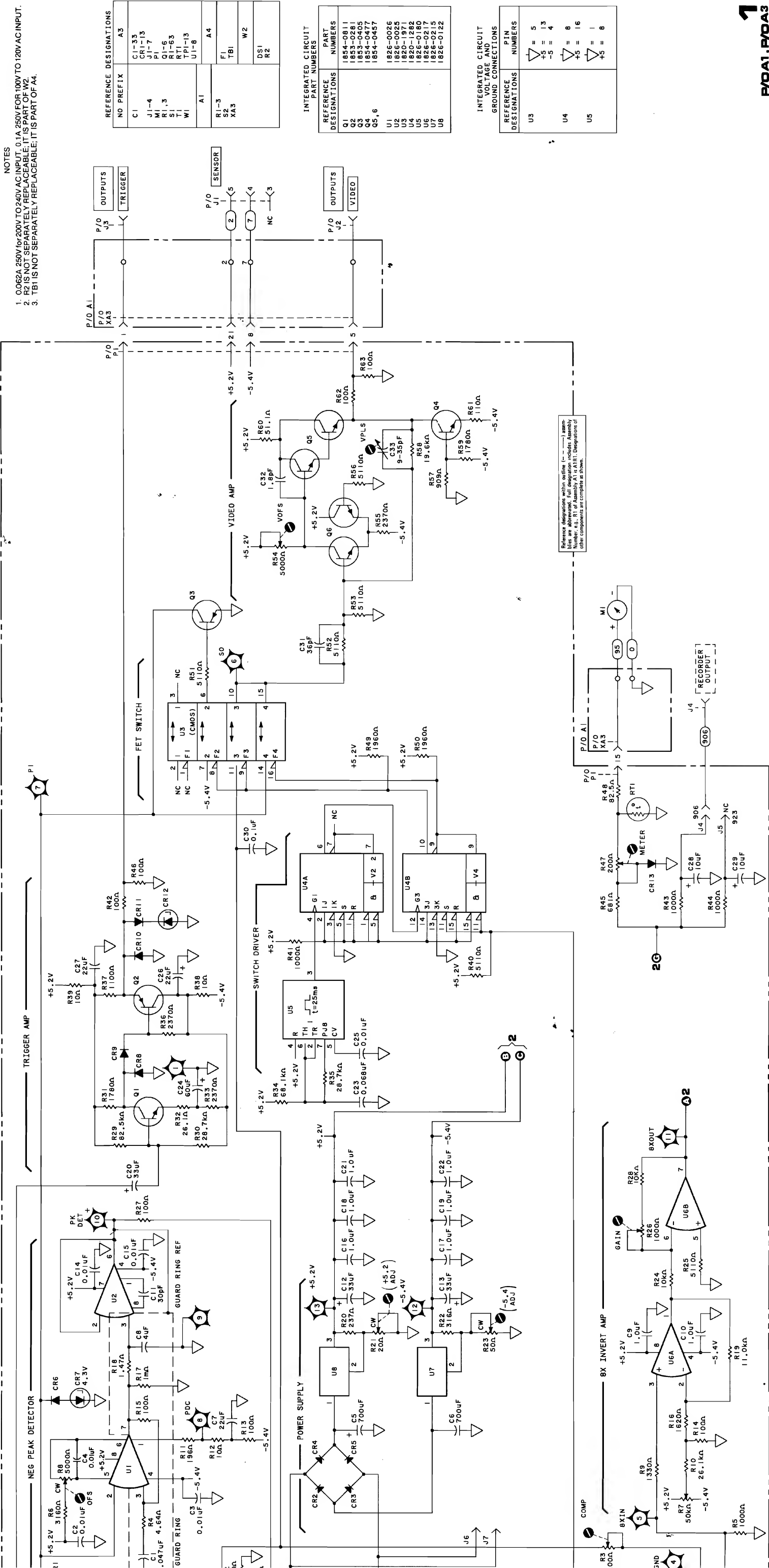
¹ The voltage at J1 pin 1 must be set precisely to -0.5562 volts or -0.1605 volts. If necessary, adjust the rf input to the power sensor to obtain these voltages at J1.

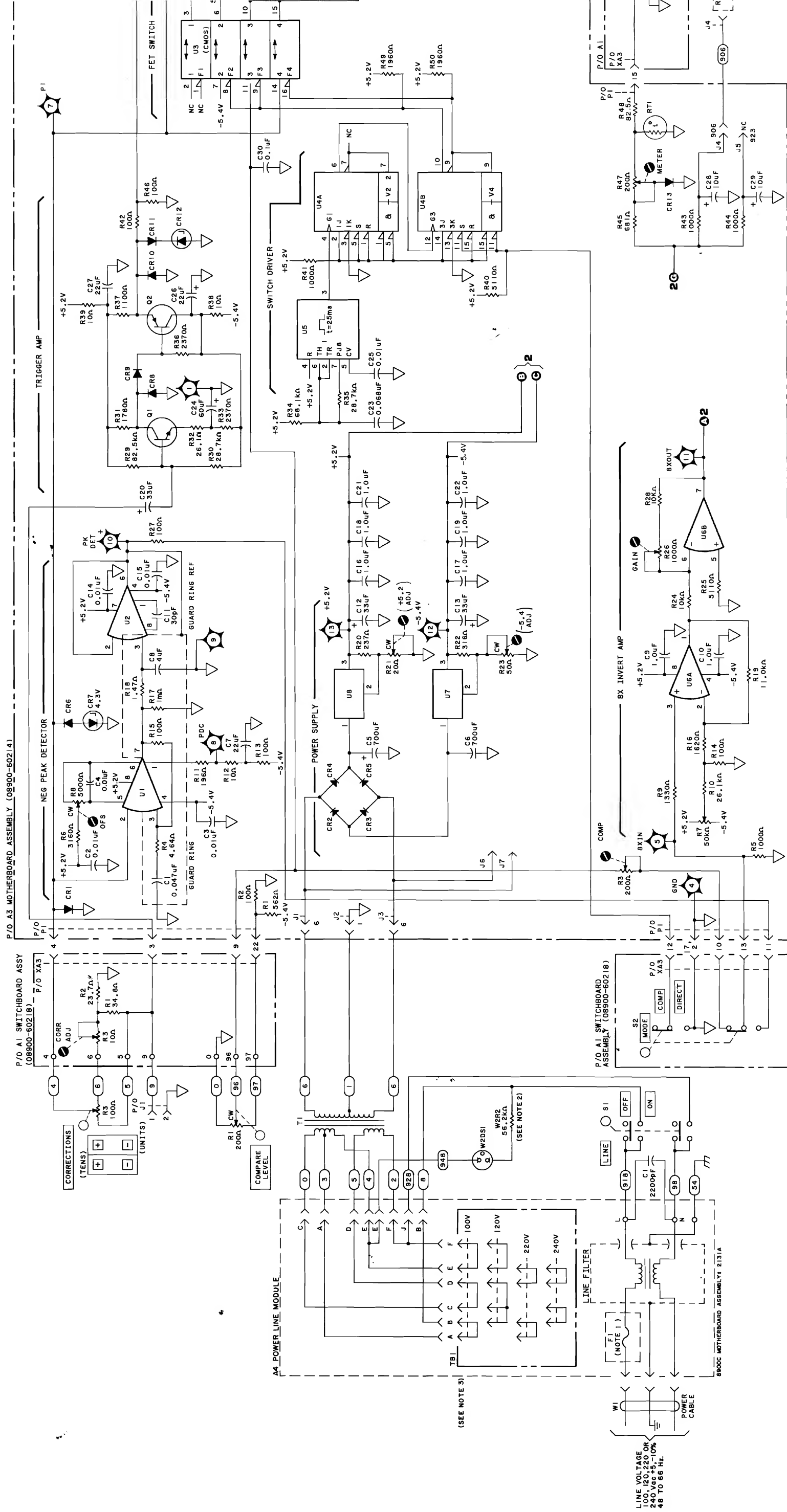
*If the troubleshooting information on this block diagram does not identify the source of a failure, refer to the troubleshooting procedures in text.

Figure 8-3. Troubleshooting Block Diagram

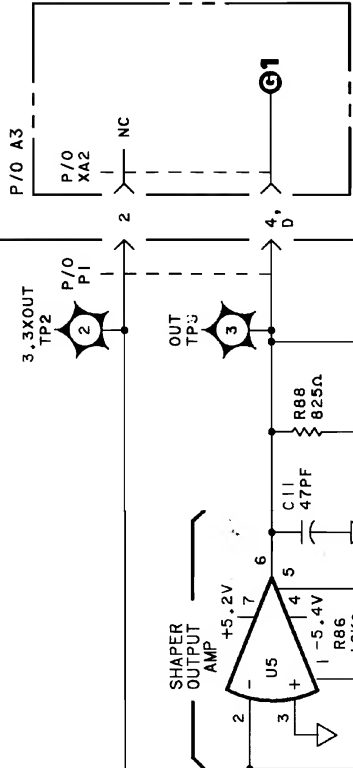
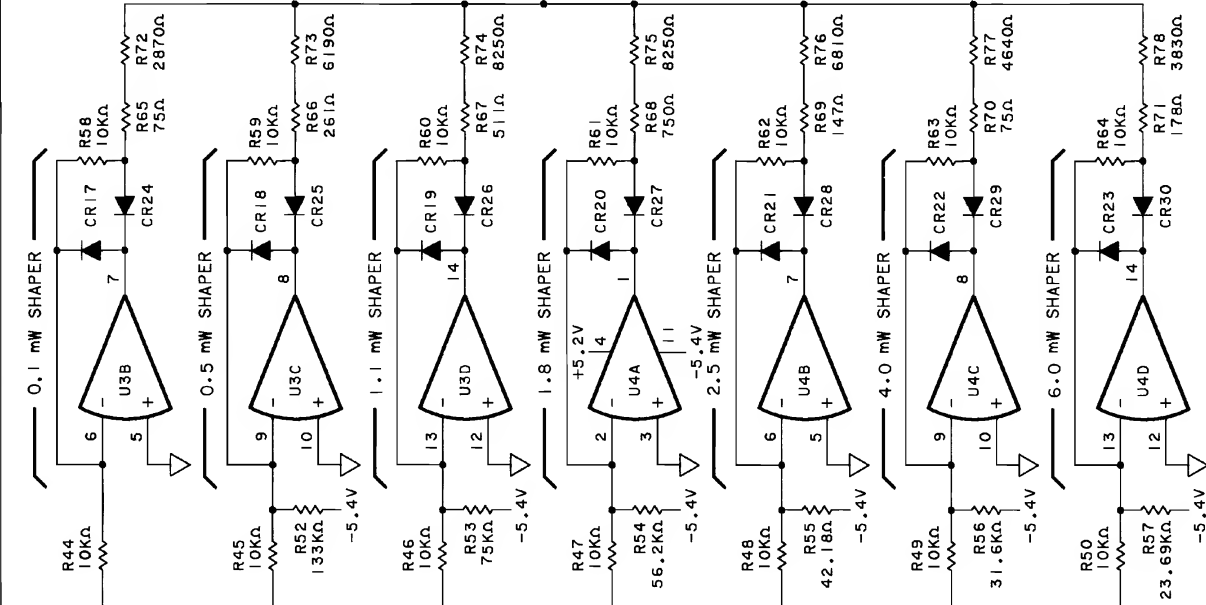
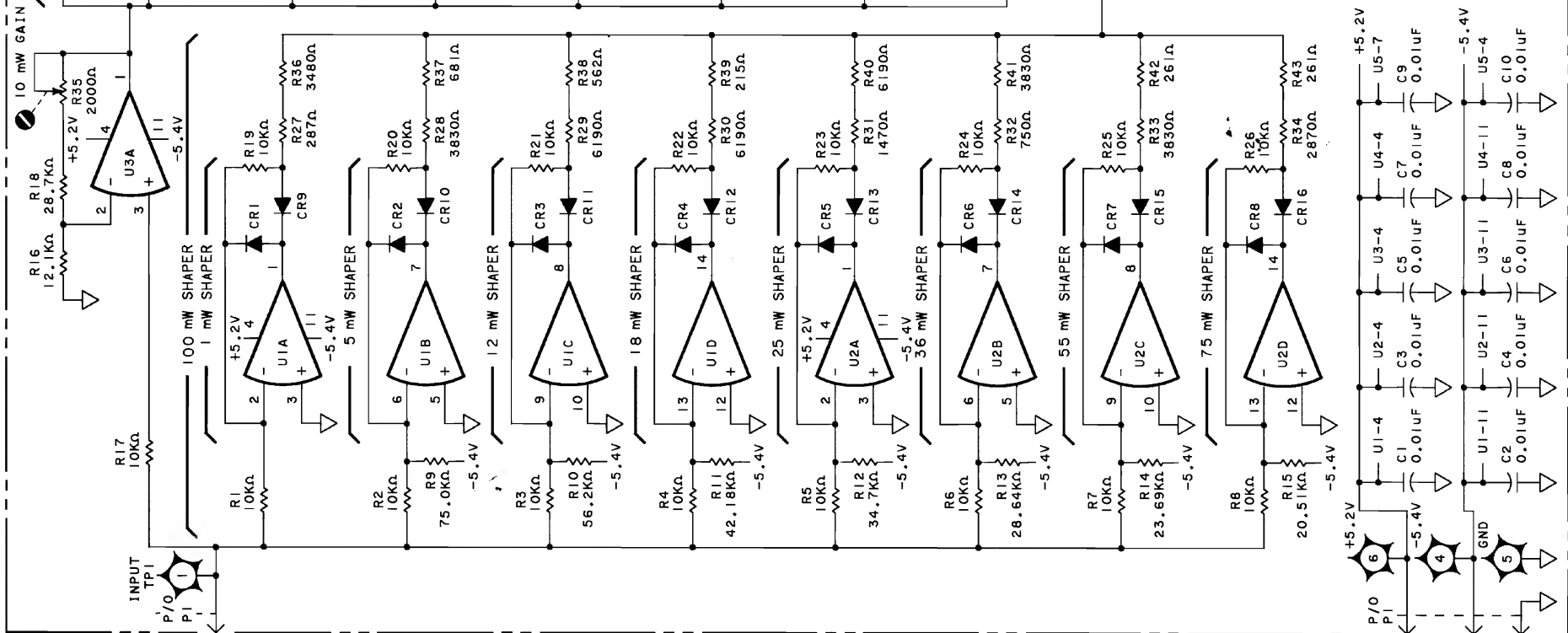
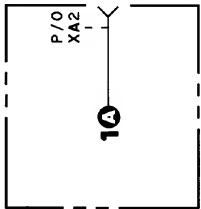
Table 8-5. Troubleshooting Voltages

INPUT	J1 Pin 1	A3TP11	A2TP1	A2TP3
100 mW	-0.5562V	+3.00 ±0.06V	+3.00 ±0.06V	+1.000 ±0.005V
10 mW	-0.1605V	+0.865 ±0.017V	+0.865 ±0.017V	+1.0000 ±0.0005V





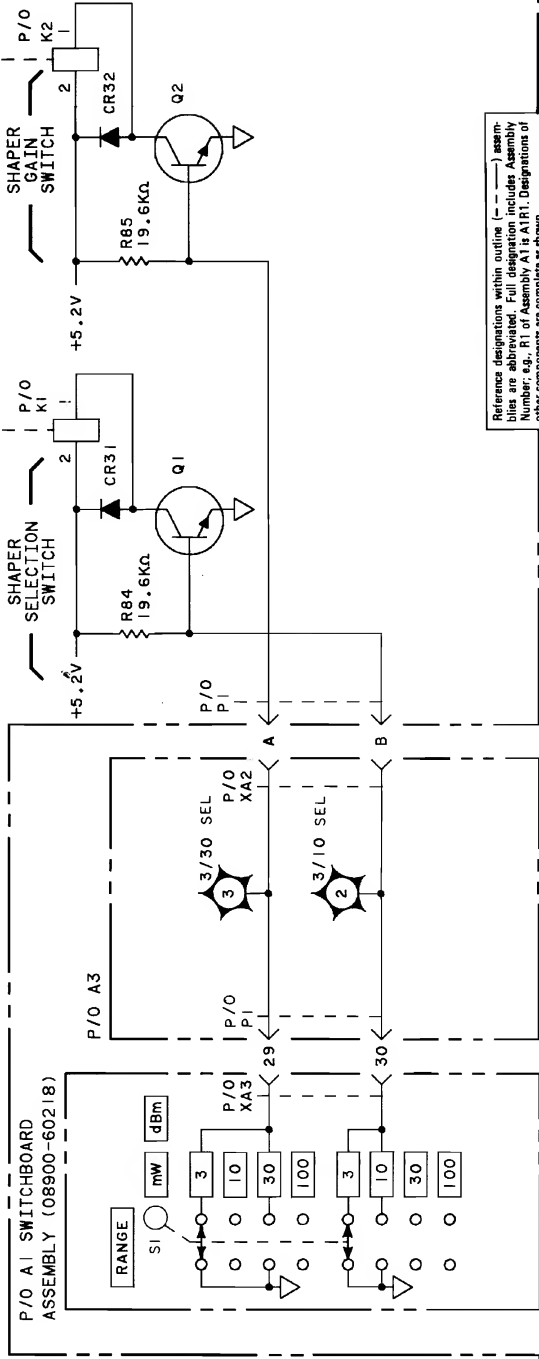
P/O A3
MOTHERBOARD
ASSEMBLY
(08900-60214)



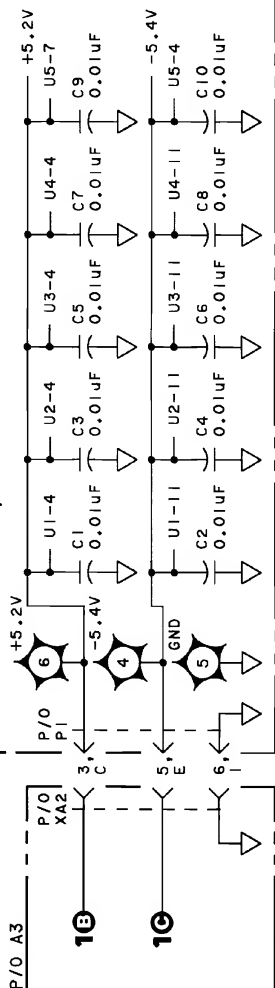
TRANSISTOR AND INTEGRATED CIRCUIT PART NUMBERS	
REFERENCE DESIGNATIONS	PART NUMBERS
Q1, 2	1854-0810
U1-4	1826-0323
U5	1826-0013

REFERENCE DESIGNATIONS	
A1	A2 CONT'D.
S1	R1-50
XA3	52-89
A2	TP1-6
	U1-5
C1-11	VR1, 2
CR1-32	A3
K1, 2	TP2, 3
P1	XA2
Q1, 2	

NOT ASSIGNED: A2R51



Reference designations within outline (---) assemblies are abbreviated. Full designation includes Assembly Number; e.g., R1 of Assembly A1 is R1A1. Designations of other components are complete as shown.



9900C SHAPER ASSEMBLY 12/31/A



**HEWLETT
PACKARD**

Should one of your HP Instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an Instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY _____

ADDRESS _____

TECHNICAL CONTACT PERSON _____

PHONE NO. _____ EXT. _____

MODEL NO. _____ SERIAL NO. _____

MODEL NO. _____ SERIAL NO. _____

P.O. NO. _____ DATE _____

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER _____ over



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MODEL NO. _____ SERIAL NO. _____

MODEL NO. _____ SERIAL NO. _____

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Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER _____ over



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MODEL NO. _____ SERIAL NO. _____

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P.O. NO. _____ DATE _____

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER _____ over



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PHONE NO. _____ EXT. _____

MODEL NO. _____ SERIAL NO. _____

MODEL NO. _____ SERIAL NO. _____

P.O. NO. _____ DATE _____

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER _____ over

Service needed

☐ CALIBRATION ONLY
☐ REPAIR ☐ REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL
CONTROL SETTINGS _____

If unit is part of system list model
number(s) of other interconnected in-
struments. _____

9320-3896

Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY
☐ REPAIR ☐ REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL
CONTROL SETTINGS _____

If unit is part of system list model
number(s) of other interconnected in-
struments. _____

9320-3896

Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY
☐ REPAIR ☐ REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

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CONTROL SETTINGS _____

If unit is part of system list model
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struments. _____

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Observed symptoms/problems

FAILURE MODE IS:

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